No. 140

BROWN & SHARPE MACHINERY AND TOOLS

MACHINERY AND TOOLS

CATALOG No. 140

R. MELLQVIST

BROWN & SHARPE MFG. CO.
PROVIDENCE, R.I., U.S.A.

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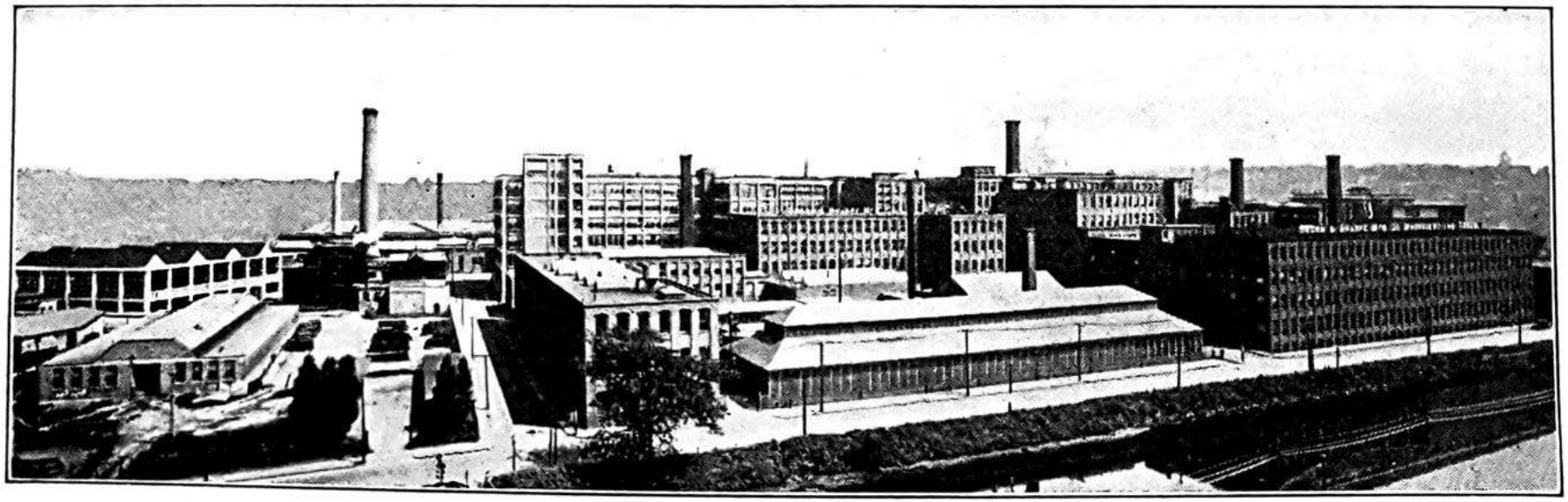

Main Office and Works of the Brown & Sharpe Mfg. Co., Providence, R.I., U.S.A.

1872

LEADING AWARDS RECEIVED

For the Excellence and High Quality of Brown & Sharpe Products

London, 1862; Paris, 1867 and 1878; Vienna, 1873; Philadelphia, 1876; Chicago, 1893; Tennessee Centennial Exposition, 1897; Buffalo, 1901; Paris, Grand Prix, 1889 and 1900; Brussels, Grand Prix, 1897; St. Louis, Grand Prize, 1904; Liége, Grand Prix, 1905; Milan, Grand Prix, 1906; Brussels, Grand Prix, 1910; Turin, Grand Prix, 1911; Tokio, 1915; New Zealand and South Seas Exhibition, 1925-6.

MACHINERY AND TOOLS

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1935
By Brown & Sharpe Mfg. Co.

B·S
TRADE MARK

Reg. U. S. Pat. Off.
and Foreign Countries

BROWN & SHARPE MFG. CO.
PROVIDENCE, R. I., U. S. A.
Established 1833
(Code name, SHARPE, PROVIDENCE)

Manufacturers of

MILLING MACHINES
SCREW MACHINES
MACHINISTS' TOOLS
GRINDING MACHINES
GEAR CUTTING MACHINES
CUTTERS and HOBS

1 9 3 5

Of General Interest

THE business now conducted by the Brown & Sharpe Mfg. Co. was founded in 1833 by David Brown and his son Joseph R. Brown. David Brown retired in 1841 and the business was continued by Joseph R. Brown until 1853, when Lucian Sharpe became his partner, and the firm of J. R. Brown & Sharpe was formed. The Brown & Sharpe Mfg. Co. was incorporated in 1868.

The manufacture of steel rules and other tools of precision was begun by Joseph R. Brown in 1850. In 1852 a similar line of work was begun by Samuel Darling and, in 1866, the partnership of Darling, Brown & Sharpe was formed, the business being carried on under that name until the partnership was dissolved by the purchase of Mr. Darling's interest in 1892.

In 1850, Mr. Brown invented and built the first linear dividing engine in America for graduating rules. The adaptation of the vernier principle to a measuring tool for machinists' use was brought out by him the following year.

In 1867 when visiting the Paris Exposition, Messrs. J. R. Brown and Lucian Sharpe, impressed with the possibilities of the original micrometer, the Systeme Palmer, developed this tool upon their return.

Their efforts were not confined to small tools alone, for as early as 1855 Mr. Brown designed and built a precision Gear Cutting Machine. The original Universal Milling Machine (1861) and the Universal Grinding Machine (1868) were both invented by Mr. Brown. The Formed Cutter was another of Mr. Brown's contributions to the metal industry.

The present buildings are modern and especially arranged to meet the requirements of the business. The machine shops are fireproof. The business, therefore, is free from danger of serious interruption, and, on work entrusted to us, customers are given security against loss by fire.

The ten main manufacturing buildings have a floor space of about 900,000 square feet, the foundry about 245,000 square feet, and the forging, hardening, central power plant, and miscellaneous buildings about 264,000 square feet. In 1853 the floor space occupied was 1,800 square feet. The present buildings have 1,409,000 square feet of floor space, or over 32 acres.

All Brown & Sharpe products are made with the intention that they shall be the best in their respective classes. Careful attention is constantly given to insure workmanship of the best quality. Should any defect become apparent in the workmanship of any of our products, we request that we be notified promptly.

We are always ready and pleased to show our works to those who are interested in machine shop practice.

Important

The Floor Space Dimensions of machines cover the extreme projections and points of travel of the various parts.

Machine Tools can be ordered direct or through our representatives.

Small Tools are carried in stock and sold by hardware and supply dealers throughout the country. In cases where they cannot readily be procured from dealers, we will send any of our small tools, upon receipt of price, to any place in the United States.

Cutters may usually be obtained from dealers at once and the delay and cost of transportation saved.

Gears are made to customers' specifications and may be ordered direct.

Catalog of the Latest Edition should be kept on hand. We are pleased to mail a copy to any address. When reference is made to page, give number of catalog found on cover. The prices and specifications are subject to change without notice.

Publications on machine tools, including treatises, may be obtained through booksellers, hardware and supply dealers, or are mailed on receipt of price, as per catalog.

Orders. We request our customers to use the names or numbers of machines and tools, as printed in the catalog. This will enable us to fill orders promptly and correctly.

In ordering tools, attachments or repair parts for machines, it is necessary to give the serial number stamped on each machine.

We would impress upon purchasers the advantage of ordering, when possible, articles that are carried in stock, in the place of goods that vary slightly from these and have to be made to order.

In ordering special tools to be graduated and figured, our customers are particularly requested to send a clear description and a sketch showing the exact position of figures and graduations wanted.

When goods are ordered to be sent by express, with bill to be collected on delivery, the express charge for collecting will be added. Small articles can be sent by mail when additional cost of postage is remitted. We are not responsible for losses in the mail.

The Machines and Tools described in this catalog are usually kept in stock and will be packed and delivered at railroad or steamer in this city, without extra charge.

Verbal Orders and Instructions should be confirmed in writing.

Please address all business communications to the Company.

We carry a representative line of machine tools and a complete line of small tools at our Western Office and Store, 626-630 Washington Boulevard, Chicago, Ill.

We also carry a representative line of small tools at our New York Office, 20 Vesey Street, Rooms 900-904.

Engineering Service

Our engineers have at their disposal considerable data and a wealth of experience gained during the many years we have been building machines and equipment.

Because of this fund of information and experience, they are well fitted to work out and design profitable methods of production for any particular job.

We are always ready to study your problems with a view of planning methods whereby the full advantages of the machines or attachments are utilized.

The Willcox & Gibbs Sewing Machines for family and factory use have been made by us for more than seventy-five years and we refer to them as an illustration of the quality of our work.

BROWN & SHARPE MFG. CO.

Milling Machines

B·S

Universal
Plain
Manufacturing
Automatic
Vertical Spindle
Attachments

Standard Milling Machines

Made in Universal, Plain and Vertical Spindle types, of constant speed drive design, these machines are noteworthy for their convenience of operation and simplicity of control, as well as for their power and rugged construction.

Either overhead or individual motor drive can be used. The main drive clutch is of the multiple dry-disk type. All driving gears and shafts throughout the machine are heat treated alloy steel and the driving shafts have integral keys. Anti-friction bearings are used in all important mechanisms and the feed and speed transmissions are of the sliding gear type. All main drive mechanisms are automatically lubricated by a filtered oiling system.

The feed engagement levers are conveniently located at the front of the machine and a duplicate set is at the rear of table for convenience in boring, face milling, etc. Feeds, shown by direct reading dials, can be changed from either front or rear operating positions by rotating a single lever. Spindle speeds, which are also direct reading, are obtained in two series by a single rotating lever. Power fast travel is provided for all movements of the table.

The double overarm construction permits convenient handling of the arbor yokes when changing arbors, cutters, etc.

The Nos. 1A Standard Universal and 1B Standard Plain are simplified machines, omitting the dual controls at the rear operating position and the power fast travel for table. The No. 1 Standard Vertical has a built-in spindle driving motor and enclosed feed driving motor.

High Speed Milling Machines

The High Speed Milling Machines have the same general features of design and operation as the corresponding Plain, Universal and Vertical Spindle types of Standard Milling Machines, with the exception of higher ranges of feeds and speeds.

In addition to the power table controls at the rear operating position the Universal and Plain High Speed Machines have dual hand feed controls automatically disengaged when the power feed is used.

With the exception of the No. 2 High Speed Vertical Spindle machine, which is of the same construction as the Standards, a built-in motor drives the power fast travel mechanism and coolant pump.

No clutch is used as the machine driving motor is controlled by the

starting lever which operates the motor switch and engages a powerful brake to stop the spindle.

Light Type Milling Machines

The Light Type Milling Machines are made in both Plain and Universal types and are particularly designed for toolroom and manufacturing use, where a moderate weight, sensitive machine is desired. They can be handled very easily and rapidly, yet are ruggedly proportioned to insure a high degree of accuracy. The speed and feed ranges run up relatively high to permit the efficient use of end mills, etc. The set-back column gives added clearance for work, vises or fixtures, and brings the cutter nearer to the spindle end. The directly connected, flanged type driving motor gives a simple and efficient application of power.

No. 0 Omniversal Milling Machine

The Omniversal Milling Machine has been designed primarily for toolroom and experimental laboratory use although it is valuable also for manufacturing departments whose work is in short runs that would not justify fixture expense for obtaining accurate settings for relative surfaces. The machine is unique in providing an easy and accurate method of obtaining simple and compound angular settings for milling and boring operations. Frequently, a number of machining positions for the work may be made without the need of relocating the work in the holding devices.

Manufacturing Milling Machines

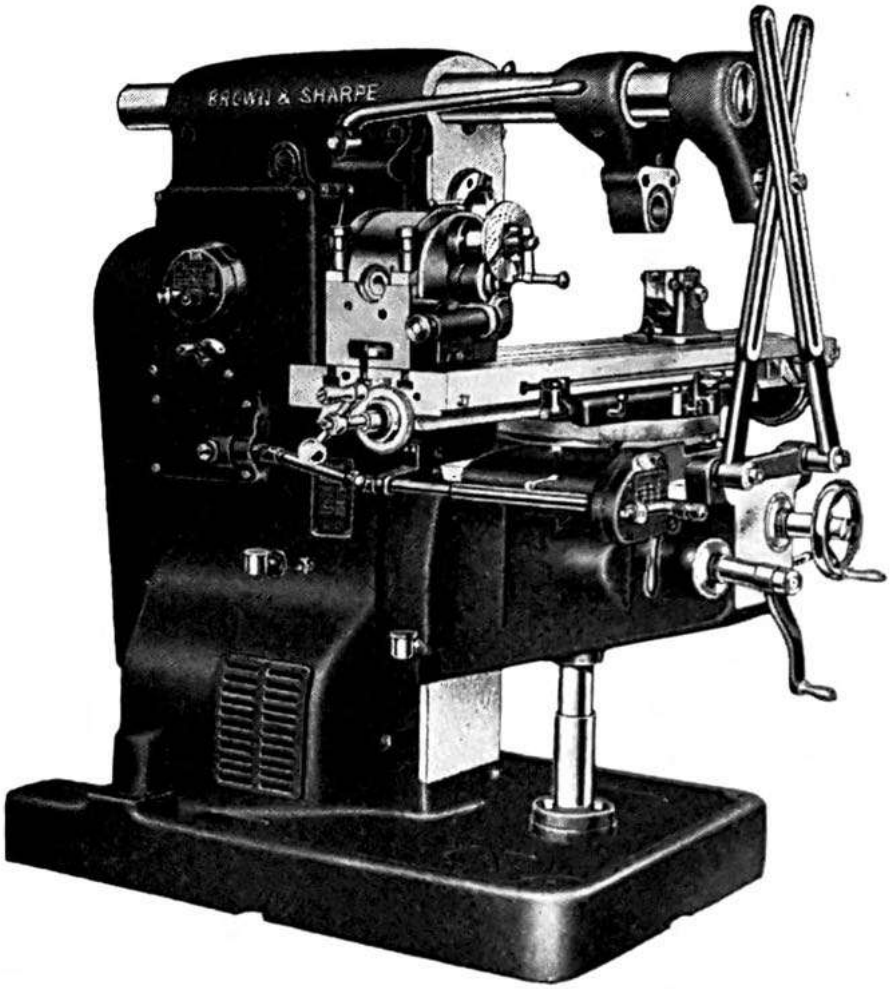
These machines are designed primarily for the manufacture of duplicate parts in quantities. They are of two styles, column and knee (with rack feed) and bed type. With the exception of Nos. 1Y and 2Y Plain, all machines can be furnished with motor as well as belt drive.

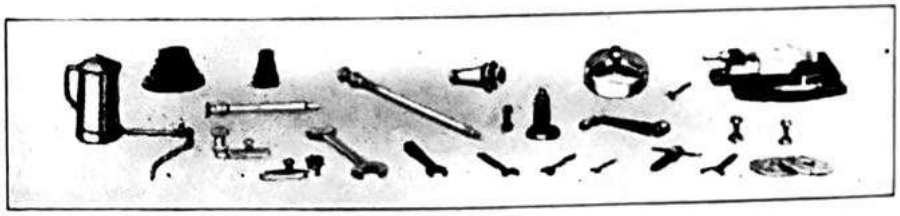
The column and knee type machines, Nos. 0Y, 1Y, 2Y and 2YB Standard Plain Milling Machines, have semi-automatic features of operation which make them particularly suitable for light manufacturing. The No. 21 Automatic, owing to the design and flexibility of control, can mill work in large quantities to advantage.

The bed type machines are often desirable because of their rugged construction and fixed table height. The No. 13 Plain is a semi-automatic machine particularly fitted for heavier manufacturing.

The No. 22 has the flexibility of the column and knee type machines for quick set-ups, combined with the production advantages of the bed type.

No. 1A Standard Universal Milling Machine



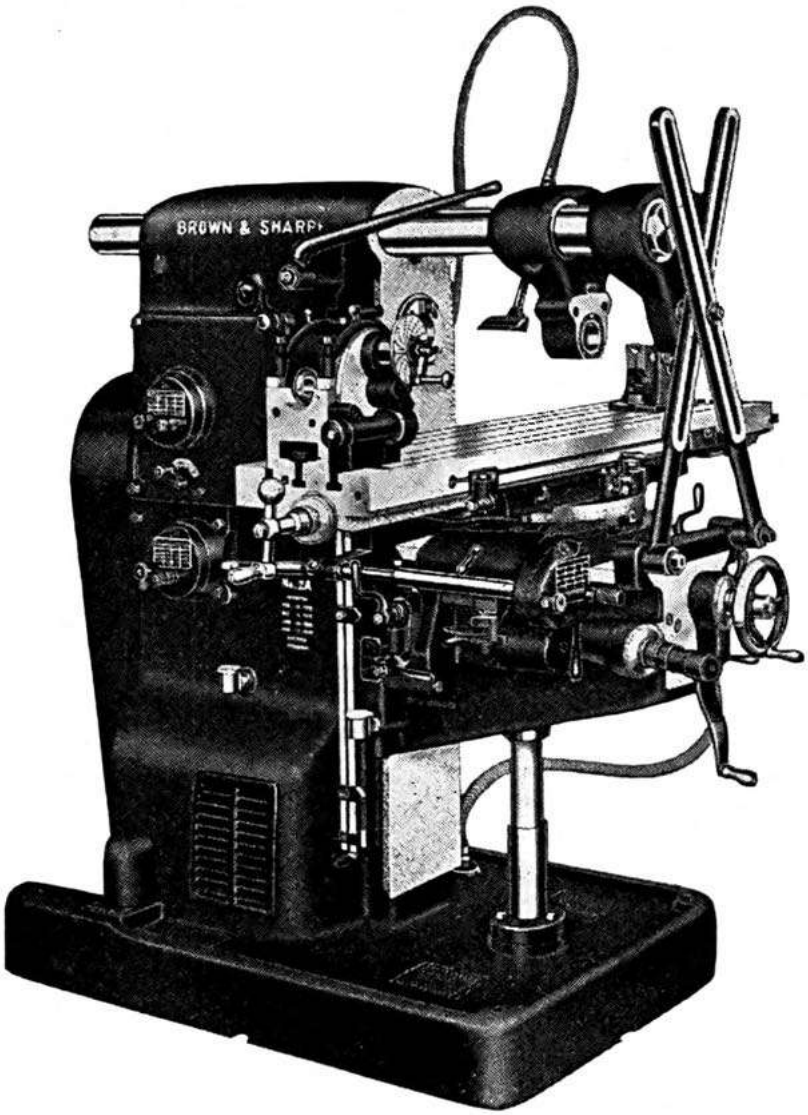


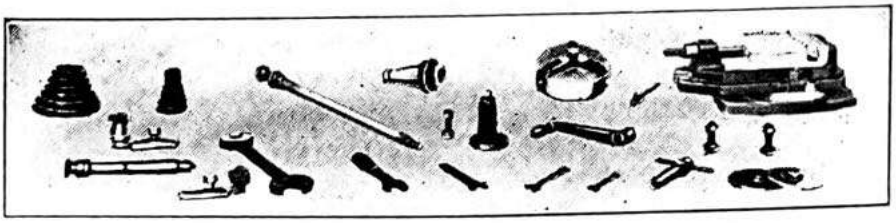
Capacity	Longitudinal feed, automatic	22″
	Transverse feed, automatic	8″
	Vertical feed	18″
	Power required to operate machine at maximum capacity	5 H.P.

No. 1A Standard Universal Milling Machine

Capacity	Power longitudinal feed . . . . . inches	22
	Power transverse feed . . . . . inches	8
	Hand vertical feed . . . . . inches	18
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	27⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	19¾
	Greatest distance, face of column to arm braces inches	23 9/16
Table	Overall dimensions . . . . . inches	46¾ x 11¼
	Working surface . . . . . inches	46¾ x 11¼
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Swing either side of zero using power feed . . . . . deg.	53
	Number of changes of Feed	16
	Range of Feeds Longitudinal . . . . . In. per min.	½ to 19⅞
	Range of Feeds Transverse . . . . . In. per min.	3/16 to 7⅞
	Provision for driving 18" Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
	Diameter of driving pulley . . . . . inches	12
	Width of belt . . . . . inches	3
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Universal Spiral Index Centers	Diameter of swing . . . . . inches	10
	Distance between centers . . . . . inches	23
	Catalog Size (Trunnion Type) . . . . . inches	10
	Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Chuck	Universal, 3-Jawed . . . . . size, inches	6
Vise	Swivel . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	83
	Parallel to spindle . . . . . inches	82
Weights (Approx.)	Net — Belt Drive . . . . . lbs.	4575
	Net — For motor . . . . . lbs.	4650
	Net — With motor . . . . . lbs.	4800
	Shipping — Belt drive . . . . . lbs.	5050
	Shipping — For motor . . . . . lbs.	5150
	Shipping — With motor . . . . . lbs.	5300
Equipment	No. 52¼ Chuck Adapter and everything else shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley diameter . . . . . inches	12
	Width of belt . . . . . inches	3½
	Friction pulley speed . . . . . r.p.m.	386
	Net Weight . . . . . lbs.	195
Coolant System.		

No. 2A Standard Universal Milling Machine



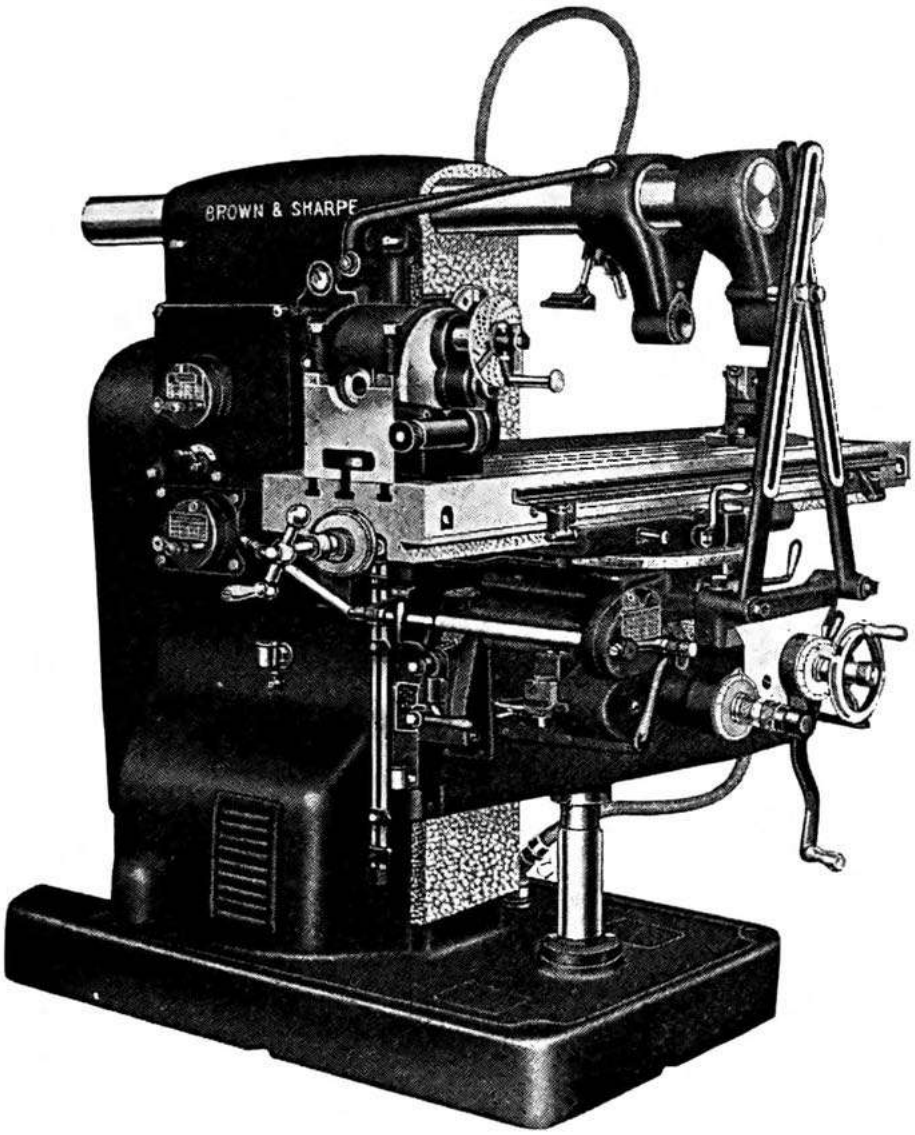


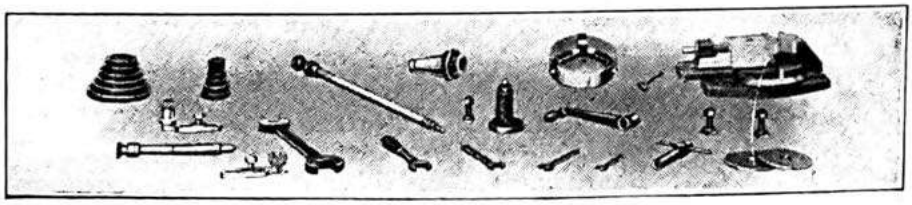
Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	10″
	Vertical feed, automatic	18″
	Power required to operate machine at maximum capacity	5 H.P.

No. 2A Standard Universal Milling Machine

Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	10
	Power vertical feed . . . . . inches	18
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	27⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	19¾
	Greatest distance, face of column to arm braces inches	23 9/16
Table	Overall dimensions . . . . . inches	51¾ x 11¼
	Working surface . . . . . inches	51¾ x 11¼
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Swing either side of zero using power feed . . . . . deg.	53
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	½ to 19⅞
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vertical . . . . In. per min.	50
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
	Diameter of driving pulley . . . . . inches	12
	Width of belt . . . . . inches	3
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Universal Spiral Index Centers	Diameter of swing . . . . . inches	10
	Distance between centers . . . . . inches	28
	Catalog Size (Trunnion Type) . . . . . inches	10
	Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Chuck	Universal, 3-Jawed . . . . . size, inches	6
Vise	Swivel . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	95
	Parallel to spindle . . . . . inches	88
Weights (Approx.)	Net — Belt drive . . . . . lbs.	4675
	Net — For motor . . . . . lbs.	4800
	Net — With motor . . . . . lbs.	5000
	Shipping — Belt drive . . . . . lbs.	5175
	Shipping — For motor . . . . . lbs.	5300
	Shipping — With motor . . . . . lbs.	5500
Equipment	No. 52¼ Chuck Adapter, coolant system and everything else shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley diameter . . . . . inches	12
	Width of belt . . . . . inches	3½
	Friction pulley speed . . . . . r.p.m.	386
	Net Weight . . . . . lbs.	200

No. 3A Standard Universal Milling Machine



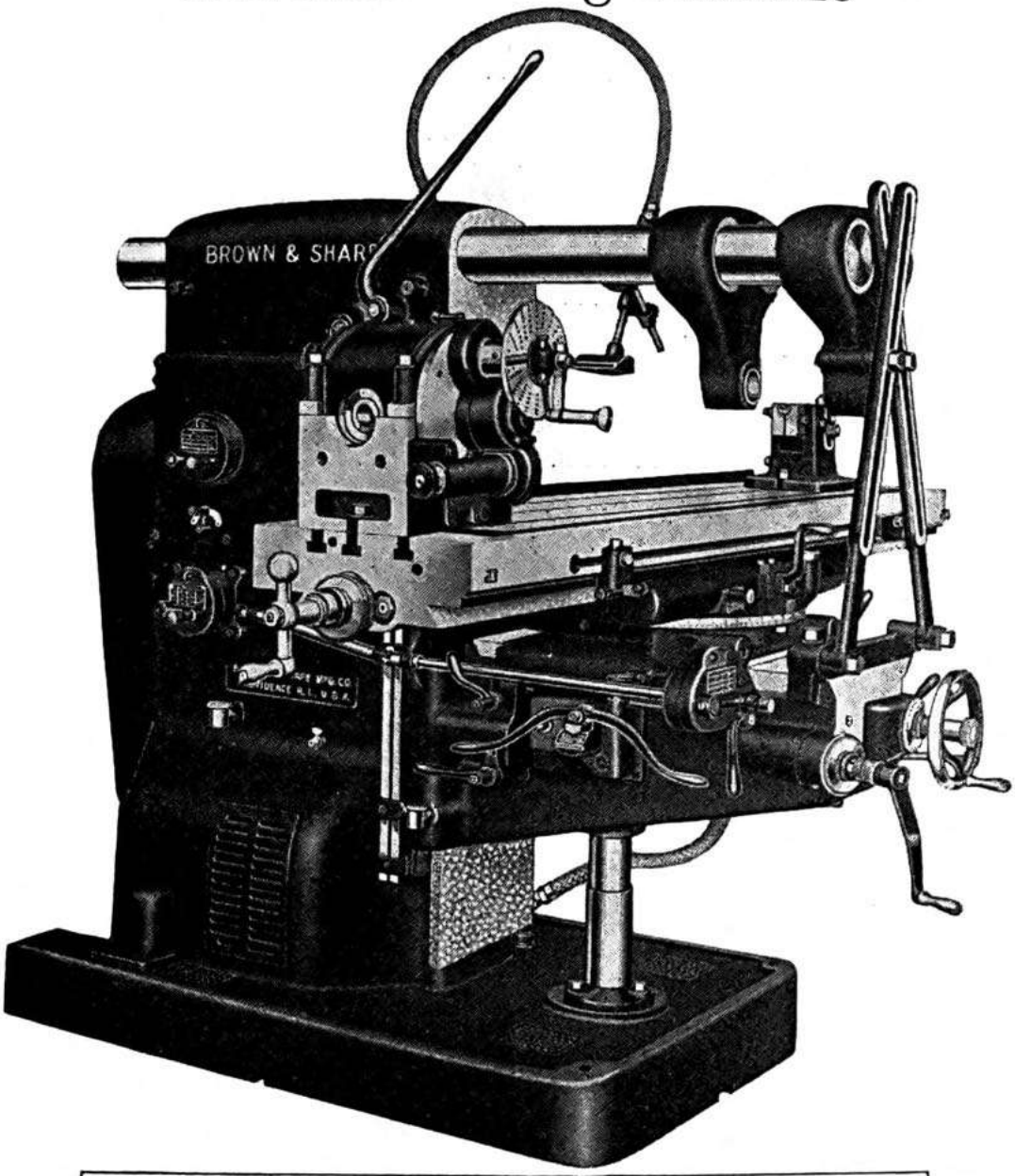


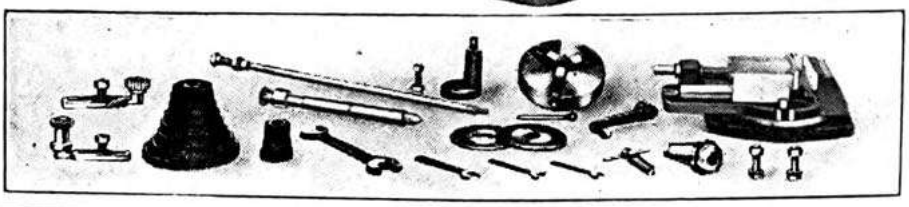
Capacity	Longitudinal feed, automatic	34″
	Transverse feed, automatic	12″
	Vertical feed, automatic	19″
	Power required to operate machine at maximum capacity	7½ H.P.

No. 3A Standard Universal Milling Machine

Capacity		Power longitudinal feed . . . . . inches	34
		Power transverse feed . . . . . inches	12
		Power vertical feed . . . . . inches	19
		Vertical distance, center of spindle to underside of arms . . . . . inches	6 31/64
		Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	30 3/8
		Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	22 7/8
		Greatest distance, face of column to arm braces inches	27 3/8
Table		Overall dimensions . . . . . inches	60 1/4 x 14
		Working surface . . . . . inches	60 1/4 x 14
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size . . . . . inches	11/16
		Swing either side of zero using power feed . . . . . deg.	53
		Number of changes of Feed	16
		Range of Feeds . . . . . In. per min.	1/2 to 19 7/8
		Power Fast Travel Longitudinal . . . . . In. per min.	100
		Power Fast Travel Trans. & Vert. . . . . In. per min.	50
		Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle		Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
		Number of changes of speed	16
		Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive	Motor	By chain and sprockets (dry-disk clutch in sprocket).	
	Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
		Diameter of driving pulley . . . . . inches	14
		Width of belt . . . . . inches	4
Arbor Bushings		Adjustable for wear . . . . . diam., inches	2 1/8
Universal Spiral Index Centers		Diameter of swing . . . . . inches	12
		Distance between centers . . . . . inches	34
		Catalog Size (Trunnion Type) . . . . . inches	12
		Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank		Cast in base . . . . . capacity, gals.	9
Chuck		Universal, 3-Jawed . . . . . size, inches	8
Vise		Swivel . . . . . Capacity (Width, Depth, Opens) inches	6 1/8 x 1 9/16 x 3 5/8
Floor Space		Right angles to spindle . . . . . inches	113 1/2
		Parallel to spindle . . . . . inches	100
Weights (Approx.)	Net	Belt drive . . . . . lbs.	6100
	Net	For motor . . . . . lbs.	6200
	Net	With motor . . . . . lbs.	6500
	Shipping	Belt drive . . . . . lbs.	6750
	Shipping	For motor . . . . . lbs.	6850
	Shipping	With motor . . . . . lbs.	7150
Equipment		No. 52 1/2 Chuck Adapter, coolant system and everything else shown in cuts.	
		Furnished as Extra—	
Countershaft		Friction pulley diameter . . . . . inches	14
		Width of belt . . . . . inches	4
		Friction pulley speed . . . . . r.p.m.	350
		Net Weight . . . . . lbs.	225

No. 4A Standard Universal Milling Machine





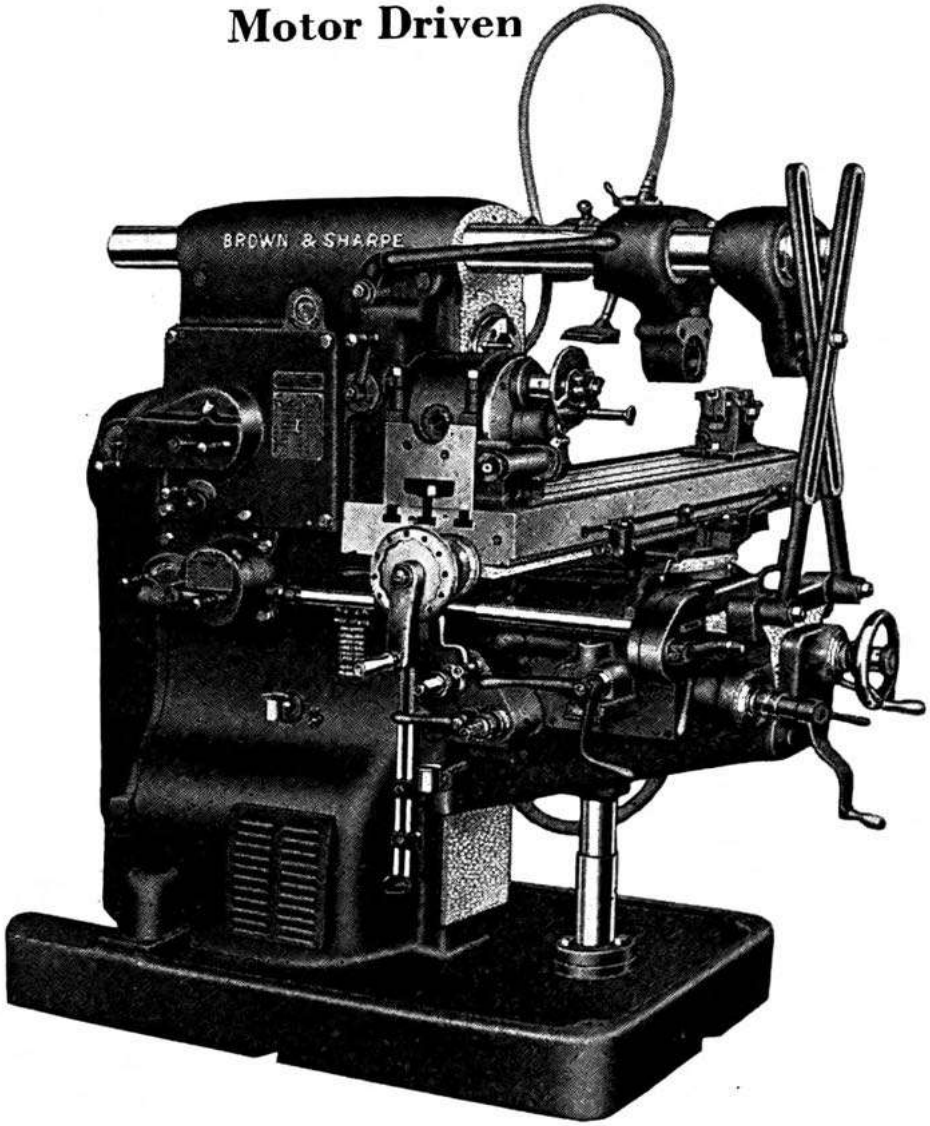
Capacity	Longitudinal feed, automatic	42″
	Transverse feed, automatic	14″
	Vertical feed, automatic	20″
	Power required to operate machine at maximum capacity	10 H.P.

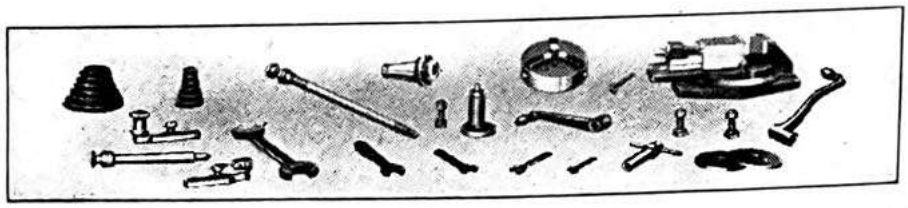
No. 4A Standard Universal Milling Machine

Capacity		Power longitudinal feed . . . . . inches	42
		Power transverse feed . . . . . inches	14
		Power vertical feed . . . . . inches	20
		Vertical distance, center of spindle to underside of arms . . . . . inches	7 21/64
		Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	37 7/8
		Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	28 3/4
		Greatest distance, face of column to arm braces . . inches	33 1/2
Table		Overall dimensions . . . . . inches	72 x 17
		Working surface . . . . . inches	72 x 17
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size . . . . . inches	13/16
		Swing either side of zero using power feed . . . . . deg.	50
		Number of changes of Feed	16
		Range of Feeds Longitudinal . . . . . In. per min.	1/2 to 19 7/8
		Range of Feeds Trans. & Vert. . . . . In. per min.	3/16 to 7 7/8
		Power Fast Travel Longitudinal . . . . . In. per min.	100
		Power Fast Travel Trans. & Vert. . . . . In. per min.	40
		Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle		Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
		Number of changes of speed	16
		Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive	Motor	By chain and sprockets (dry-disk clutch in sprocket).	
	Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
		Diameter of driving pulley . . . . . inches	15
		Width of belt . . . . . inches	5
Arbor Bushings		Adjustable for wear . . . . . diam., inches	2 3/4
Universal Spiral Index Centers		Diameter of swing . . . . . inches	14
		Distance between centers . . . . . inches	40 1/2
		Catalog Size (Trunnion Type) . . . . . inches	14
		Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank		Cast in base . . . . . capacity, gals.	16
Chuck		Universal, 3-Jawed . . . . . size, inches	9
Vise		Swivel . . . . . Capacity (Width, Depth, Opens) inches	7 1/8 x 2 x 4 1/2
Floor Space		Right angles to spindle . . . . . inches	126 3/4
		Parallel to spindle . . . . . inches	120
Weights (Approx.)	Net	Belt drive . . . . . lbs.	8525
	Net	For motor . . . . . lbs.	8750
	Net	With motor . . . . . lbs.	9220
	Shipping	Belt drive . . . . . lbs.	9525
	Shipping	For motor . . . . . lbs.	9750
	Shipping	With motor . . . . . lbs.	10220
Equipment		No. 52 3/4 Chuck Adapter, coolant system and everything else shown in cuts.	
		Furnished as Extra—	
Countershaft		Pair tight and loose pulleys . . . . . diam., inches	16
		Width of belt . . . . . inches	5
		Speed . . . . . r.p.m.	420
		Net Weight . . . . . lbs.	350

No. 2A High Speed Universal Milling Machine

Motor Driven





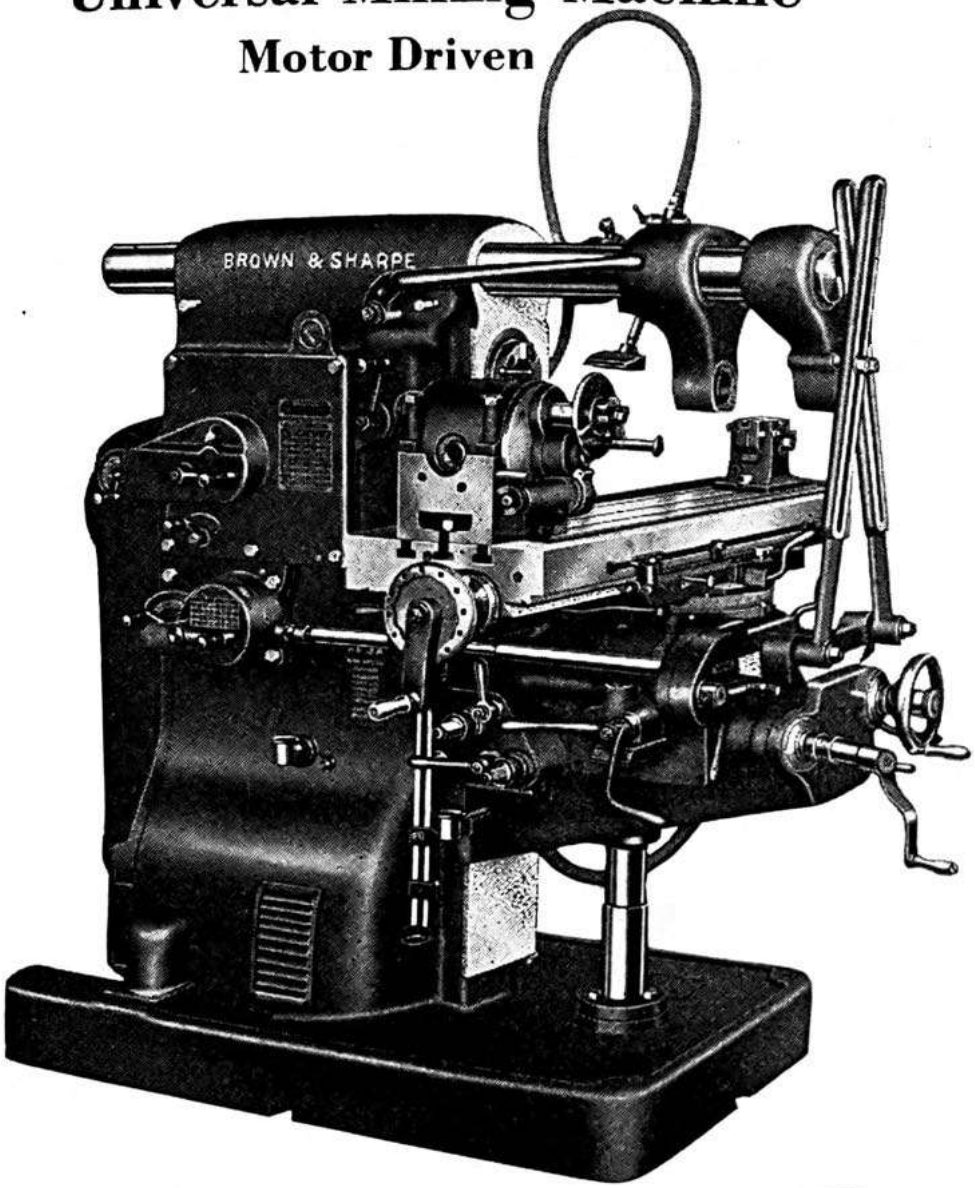
Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	10″
	Vertical feed, automatic	17½″
	Power required to operate machine at maximum capacity	5 H.P.

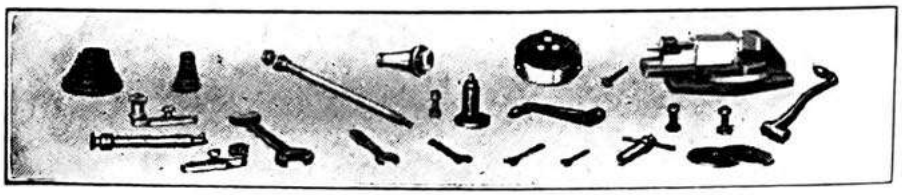
No. 2A High Speed Universal Milling Machine
Motor Driven

Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	10
	Power vertical feed . . . . . inches	17½
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	27⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	19¾
	Greatest distance, face of column to arm braces inches	23 9/16
Table	Overall dimensions . . . . . inches	51¾ x 11 11/16
	Working surface . . . . . inches	51¾ x 11 11/16
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Swing either side of zero using power feed . . . . . deg.	52
	Number of changes of Feed	32
	Range of Feeds Longitudinal . . . . . In. per min.	½ to 62
	Range of Feeds Trans. & Vertical . . . . . In. per min.	3/16 to 24¾
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vertical . . . . In. per min.	40
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	32
	Range of speeds in either direction . . . . . r.p.m.	20 to 1300
Drive	By constant speed motor through chain and sprockets. Individual built-in motor for operating power fast travel and coolant pump.	
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Universal Spiral Index Centers	Diameter of swing . . . . . inches	10
	Distance between centers . . . . . inches	28
	Catalog Size (Trunnion Type) . . . . . inches	10
	Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Chuck	Universal, 3-Jawed . . . . . size, inches	6
Vise	Swivel . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	95
	Parallel to spindle . . . . . inches	88
Weights (Approx.)	Net Fitted for machine driving motor . . . . . lbs.	5000
	Net With motor . . . . . lbs.	5200
	Shipping Fitted for machine driving motor . . . . . lbs.	5500
	Shipping With motor . . . . . lbs.	5700
Equipment	No. 52¼ Chuck Adapter, coolant system, power fast travel motor, and everything else shown in cuts.	

No. 3A High Speed Universal Milling Machine

Motor Driven





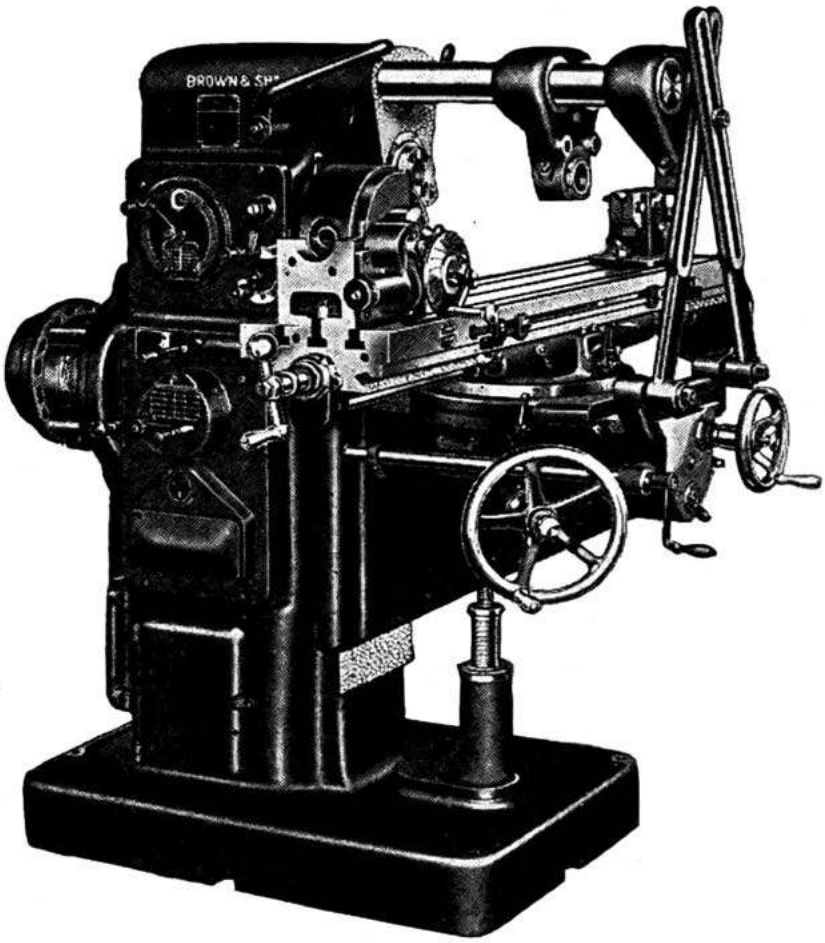
Capacity	Longitudinal feed, automatic	34″
	Transverse feed, automatic	12″
	Vertical feed, automatic	18½″
	Power required to operate machine at maximum capacity	7½ H.P.

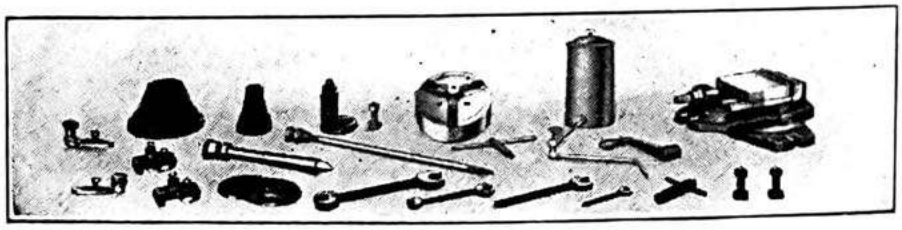
No. 3A High Speed Universal Milling Machine

Motor Driven

Capacity	Power longitudinal feed . . . . . inches	34
	Power transverse feed . . . . . inches	12
	Power vertical feed . . . . . inches	18½
	Vertical distance, center of spindle to underside of arms . . . . . inches	6 31/64
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	30⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	22⅞
	Greatest distance, face of column to arm braces inches	27⅜
Table	Overall dimensions . . . . . inches	60¼ x 14
	Working surface . . . . . inches	60¼ x 14
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Swing either side of zero using power feed . . . . . deg.	52
	Number of changes of Feed	32
	Range of Feeds Longitudinal . . . . . In. per min.	½ to 62
	Range of Feeds Trans. & Vert. . . . . In. per min.	3/16 to 24¾
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	40
	Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	32
	Range of speeds in either direction . . . . . r.p.m.	20 to 1300
Drive	By constant speed motor through chain and sprockets. Individual built-in motor for operating power fast travel and coolant pump.	
Arbor Bushings	Adjustable for wear . . . . . diam., inches	2⅛
Universal Spiral Index Centers	Diameter of swing . . . . . inches	12
	Distance between centers . . . . . inches	34
	Catalog Size (Trunnion Type) . . . . . inches	12
	Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank	Cast in base . . . . . capacity, gals.	9
Chuck	Universal, 3-Jawed . . . . . size, inches	8
Vise	Swivel . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	113½
	Parallel to spindle . . . . . inches	100
Weights (Approx.)	Net Fitted for machine driving motor . . . . . lbs.	6425
	Net With motor . . . . . lbs.	6725
	Shipping Fitted for machine driving motor . . . . . lbs.	7075
	Shipping With motor . . . . . lbs.	7375
Equipment	No. 52½ Chuck Adapter, coolant system, power fast travel motor and everything else shown in cuts.	

No. 2
Universal Milling Machine
Light Type





Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	10″
	Vertical feed, automatic	15″
	Power required to operate machine at maximum capacity	3 H.P.

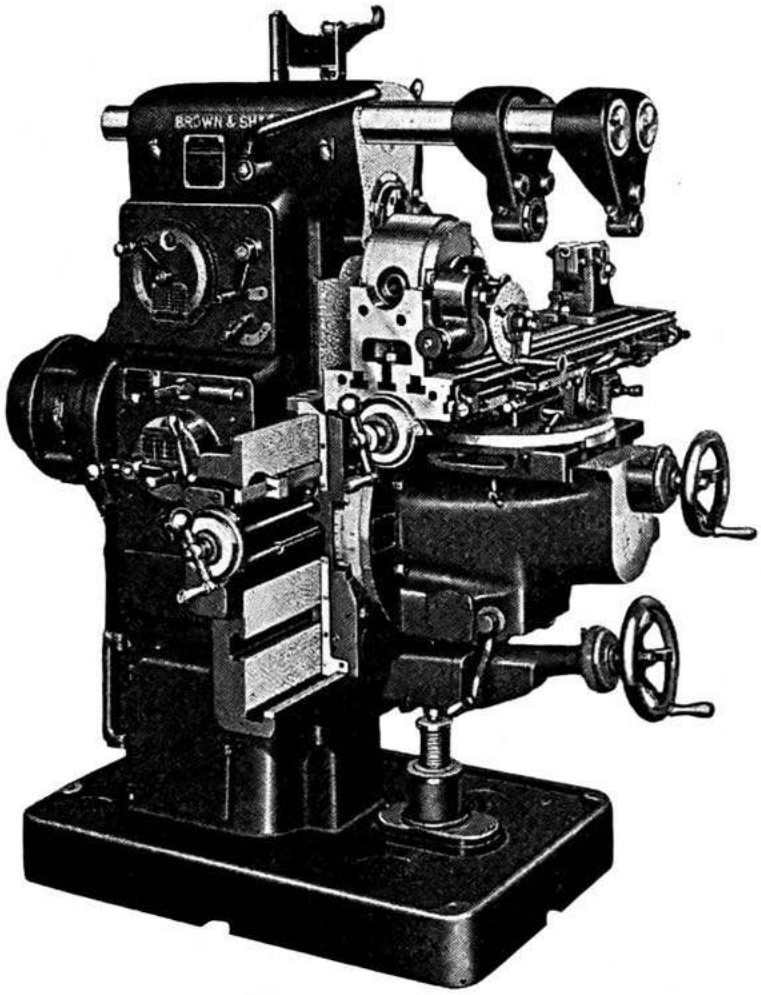
No. 2 Universal Milling Machine
Light Type

Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	10
	Power vertical feed . . . . . inches	15
	Vertical distance, center of spindle to underside of arms . . . . . inches	4 11/16
	Greatest distance, end of spindle to bushing in outer arbor yoke without arm braces . . . . . inches	17½
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	17½
	Greatest distance, face of column to arm braces inches	24
Table	Overall dimensions . . . . . inches	50½ x 10
	Working surface . . . . . inches	45 x 10
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Swing either side of zero using power feed . . . . . deg.	50
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	½ to 18¼
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 40 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	40 to 1300
Drive	By constant speed flanged type motor (3 H.P.)	
Arbor Bushings (adjustable for wear)	Diameter in inner aluminum arbor yoke . . . . . inches	1⅞
	Diameter in outer aluminum arbor yoke . . . . . inches	23/32
Universal Spiral Index Centers	Diameter of swing . . . . . inches	10
	Distance between centers . . . . . inches	28
	Catalog Size (Quadrant Type) . . . . . inches	10
	Differential Indexing . . . . . All Nos.	1 to 382
Coolant Tank	Cast in base . . . . . capacity, gals.	6
Chuck	Universal, 3-Jawed . . . . . size, inches	6
Vise	Swivel . . . . . Capacity (Width, Depth, Opens) inches	5⅛ x 1¼ x 2¾
Floor Space	Right angles to spindle . . . . . inches	92
	Parallel to spindle . . . . . inches	84
Weights (Approx.)	Net, With motor . . . . . lbs.	2700
	Shipping, With motor . . . . . lbs.	3175
Equipment	Wrenches and everything else shown in cuts.	

Furnished as Extra—

Coolant System.

No. 0
Omniversal Milling Machine

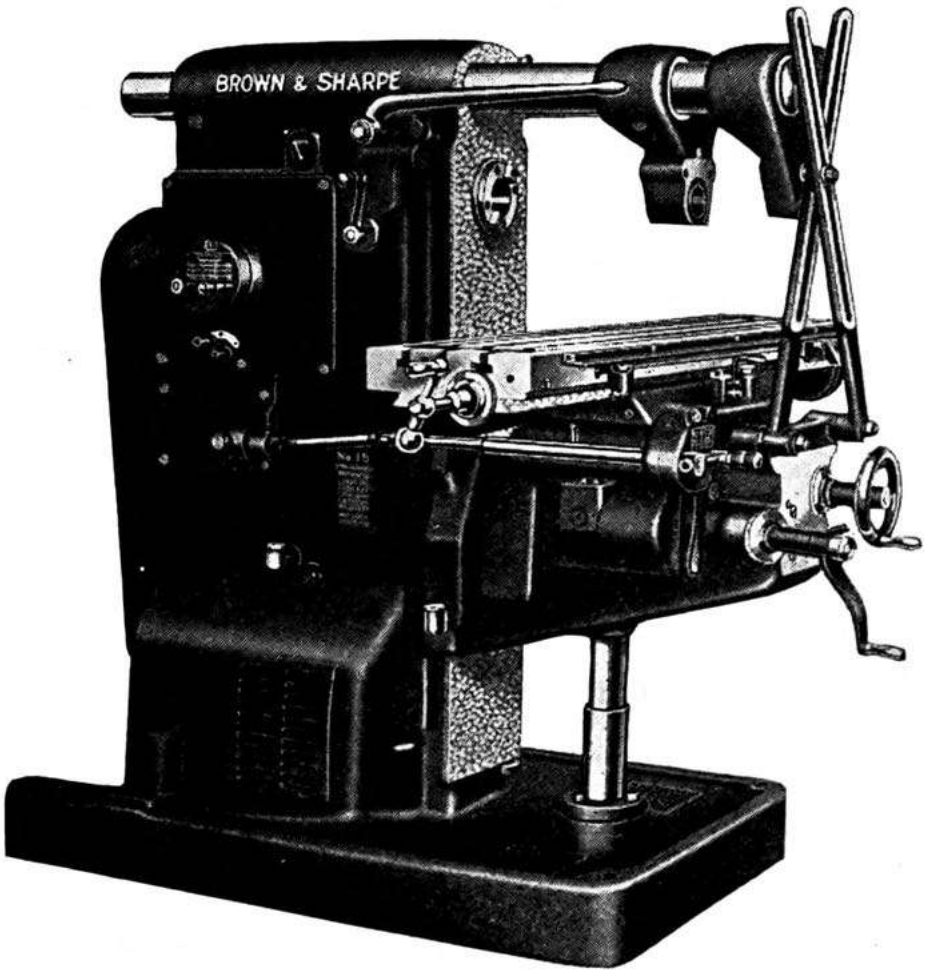


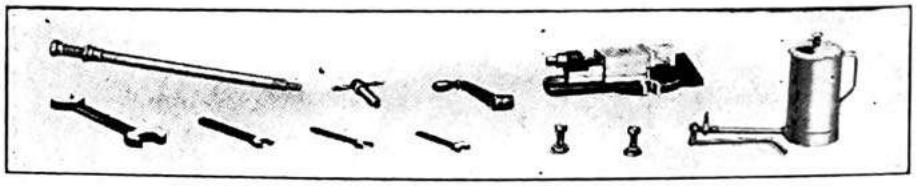
Capacity	Longitudinal feed, automatic — table	17″
	Longitudinal feed, automatic — knee saddle	17″
	Longitudinal feed, automatic — combined (table horizontal)	34″
	Transverse feed	6″
	Vertical feed	10⅜″
	Power required to operate machine at maximum capacity	2 H.P.

No. 0 Omniversal Milling Machine

Capacity	Power longitudinal feed — Table . . . . . inches	17
	Power longitudinal feed — Knee saddle . . . . . inches	17
	Power longitudinal feed — Combined (table horizontal) inches	34
	Hand transverse feed . . . . . inches	6
	Hand vertical feed . . . . . inches	10 3/8
	Vertical distance, center of spindle to underside of arms . . . . . inches	4 11/16
	Greatest distance, end of spindle to bushing in outer arbor yoke . . . . . inches	17 1/2
Table	Overall dimensions . . . . . inches	34 1/2 x 9
	Working surface . . . . . inches	34 1/2 x 9
	T-slots (Standardized) — Number	3
	T-slots (Standardized) — Size . . . . . inches	11/16
	Swing either side of zero using power feed . . . . . deg.	50
	Table saddle vernier reads to . . . . . minutes	2
Longitudinal Feed (Table and Knee Saddle)	Number of changes	16
	Range . . . . . in. per min.	1/2 to 18 1/4
	Table and knee saddle feeds can be used in conjunction or individually.	
Knee	Swivels either side of zero . . . . . deg.	60
	Swivel vernier reads to . . . . . minutes	2
Spindle	Hardened and ground. Has Standardized End. No. 40 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	40 to 1300
Drive	By constant speed flanged type motor (2 H.P.)	
Arbor Bushings (adjustable for wear)	Diameter in inner aluminum arbor yoke . . . . . inches	1 7/8
	Diameter in outer aluminum arbor yoke . . . . . inches	23/32
Universal Milling Att. with Att. Crane	Spindle has Cam Lock construction, No. 30 Milling Machine Standard taper hole.	
	Spindle speeds . . . . . r.p.m.	82 to 2674
	Center of spindle to face of column . . . . . inches	11
	Set to any angle in vertical or horizontal planes by verniers reading to . . . . . minutes	2
Universal Spiral Index Centers	Diameter of swing . . . . . inches	10
	Distance between centers . . . . . inches	14 1/2
	Catalog Size (Quadrant Type) . . . . . inches	10
	Differential Indexing . . . . . All Nos.	1 to 382
Chuck	Universal, 3-Jawed . . . . . size, inches	6
Vise	Swivel. . . . . Capacity (Width, Depth, Opens) inches	5 1/8 x 1 1/4 x 2 3/4
Floor Space	Right angles to spindle . . . . . inches	68
	Parallel to spindle . . . . . inches	70
Weights (Approx.)	Net, with motor . . . . . lbs.	3000
	Shipping, with motor . . . . . lbs.	3475
Equipment	Wrenches and everything else shown in cuts.	

No. 1B Standard Plain Milling Machine



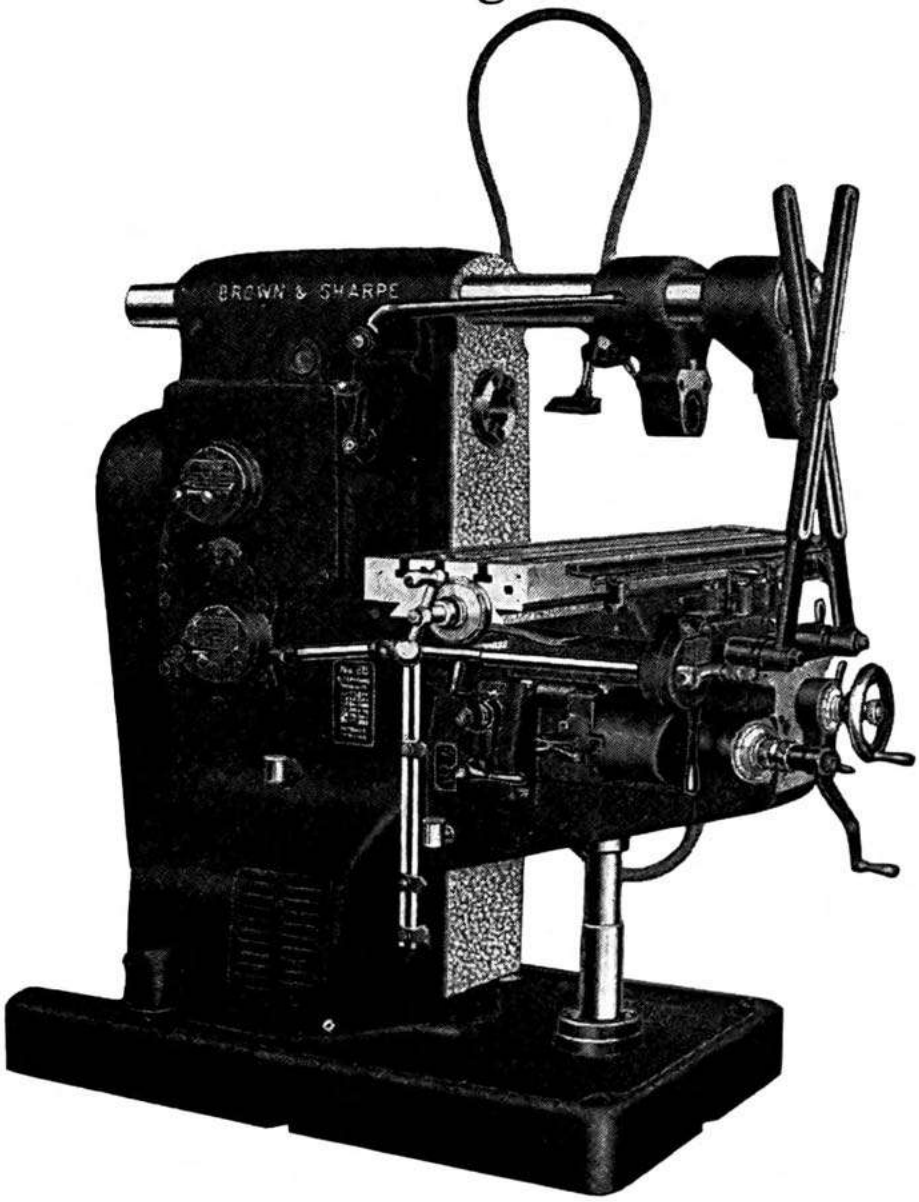


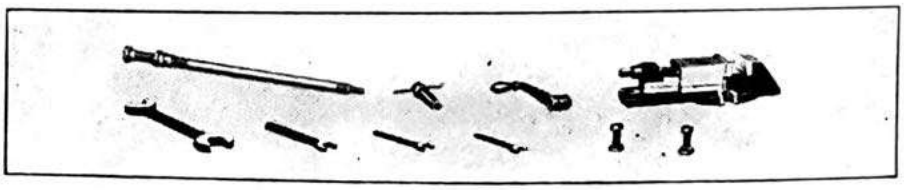
Capacity	Longitudinal feed, automatic	22″
	Transverse feed, automatic	8″
	Vertical feed	19″
	Power required to operate machine at maximum capacity	5 H.P.

No. 1B Standard Plain Milling Machine

Capacity		Power longitudinal feed . . . . . inches	22
		Power transverse feed . . . . . inches	8
		Hand vertical feed . . . . . inches	19
		Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
		Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	27⅜
		Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	19¾
		Greatest distance, face of column to arm braces . inches	23 9/16
Table		Overall dimensions . . . . . inches	46¾ x 11¼
		Working surface . . . . . inches	46¾ x 11¼
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size . . . . . inches	11/16
		Number of changes of Feed	16
		Range of Feeds . . . . . In. per min.	½ to 19⅞
		Provision for driving 18″ Rotary Attachment.	
Spindle		Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
		Number of changes of speed	16
		Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive	Motor	By chain and sprockets (dry-disk clutch in sprocket).	
	Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
		Diameter of driving pulley . . . . . inches	12
		Width of belt . . . . . inches	3
Arbor Bushings (adjustable for wear)		Diameter in inner arbor yoke . . . . . inches	2⅛
		Diameter in outer arbor yoke . . . . . inches	23/32
Coolant Tank		Cast in base . . . . . capacity, gals.	8
Vise		Flanged . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space		Right angles to spindle . . . . . inches	83
		Parallel to spindle . . . . . inches	68½
Weights (Approx.)	Net	Belt drive . . . . . lbs.	4350
		For motor . . . . . lbs.	4400
		With motor . . . . . lbs.	4600
	Shipping	Belt drive . . . . . lbs.	4825
		For motor . . . . . lbs.	4900
		With motor . . . . . lbs.	5100
Equipment		Everything shown in cuts.	
		Furnished as Extra—	
Countershaft		Friction pulley diameter . . . . . inches	12
		Width of belt . . . . . inches	3½
		Friction pulley speed . . . . . r.p.m.	386
		Net Weight . . . . . lbs.	195
Coolant System.			
Power Fast Travel for table (longitudinal).			

No. 2B Standard Plain Milling Machine



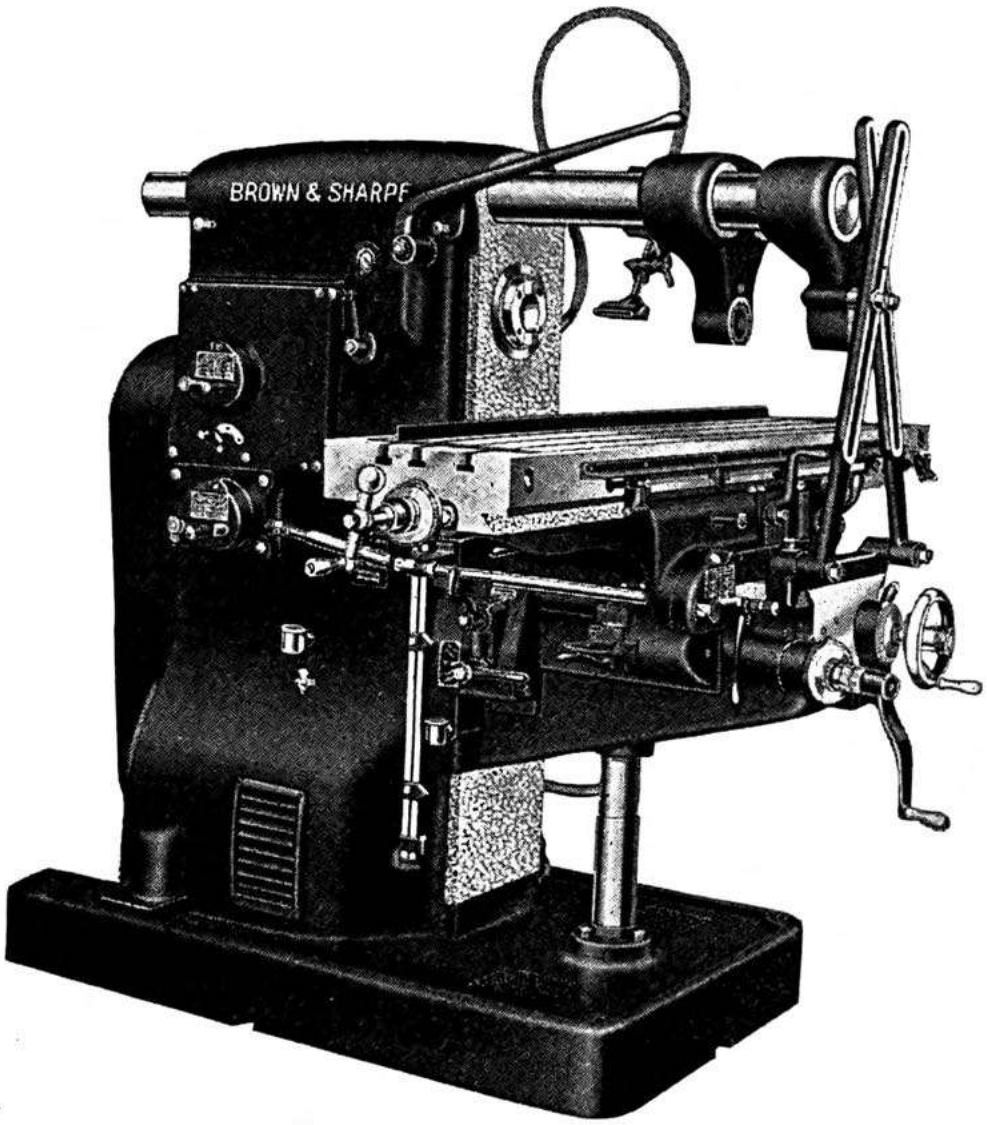


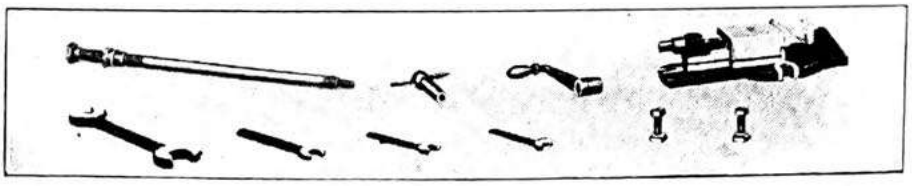
Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	10″
	Vertical feed, automatic	19″
	Power required to operate machine at maximum capacity	5 H.P.

No. 2B Standard Plain Milling Machine

Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	10
	Power vertical feed . . . . . inches	19
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	27⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	19¾
	Greatest distance, face of column to arm braces . inches	23 9/16
Table	Overall dimensions . . . . . inches	51¾ x 11¼
	Working surface . . . . . inches	51¾ x 11¼
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	½ to 19⅞
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	50
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
	Diameter of driving pulley . . . . . inches	12
	Width of belt . . . . . inches	3
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	95
	Parallel to spindle . . . . . inches	68½
Weights (Approx.)	Net — Belt drive . . . . . lbs.	4375
	Net — For motor . . . . . lbs.	4450
	Net — With motor . . . . . lbs.	4675
	Shipping — Belt drive . . . . . lbs.	4850
	Shipping — For motor . . . . . lbs.	4925
	Shipping — With motor . . . . . lbs.	5150
Equipment	Coolant system and everything shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley diameter . . . . . inches	12
	Width of belt . . . . . inches	3½
	Friction pulley speed . . . . . r.p.m.	386
	Net Weight . . . . . lbs.	200

No. 3B Standard Plain Milling Machine



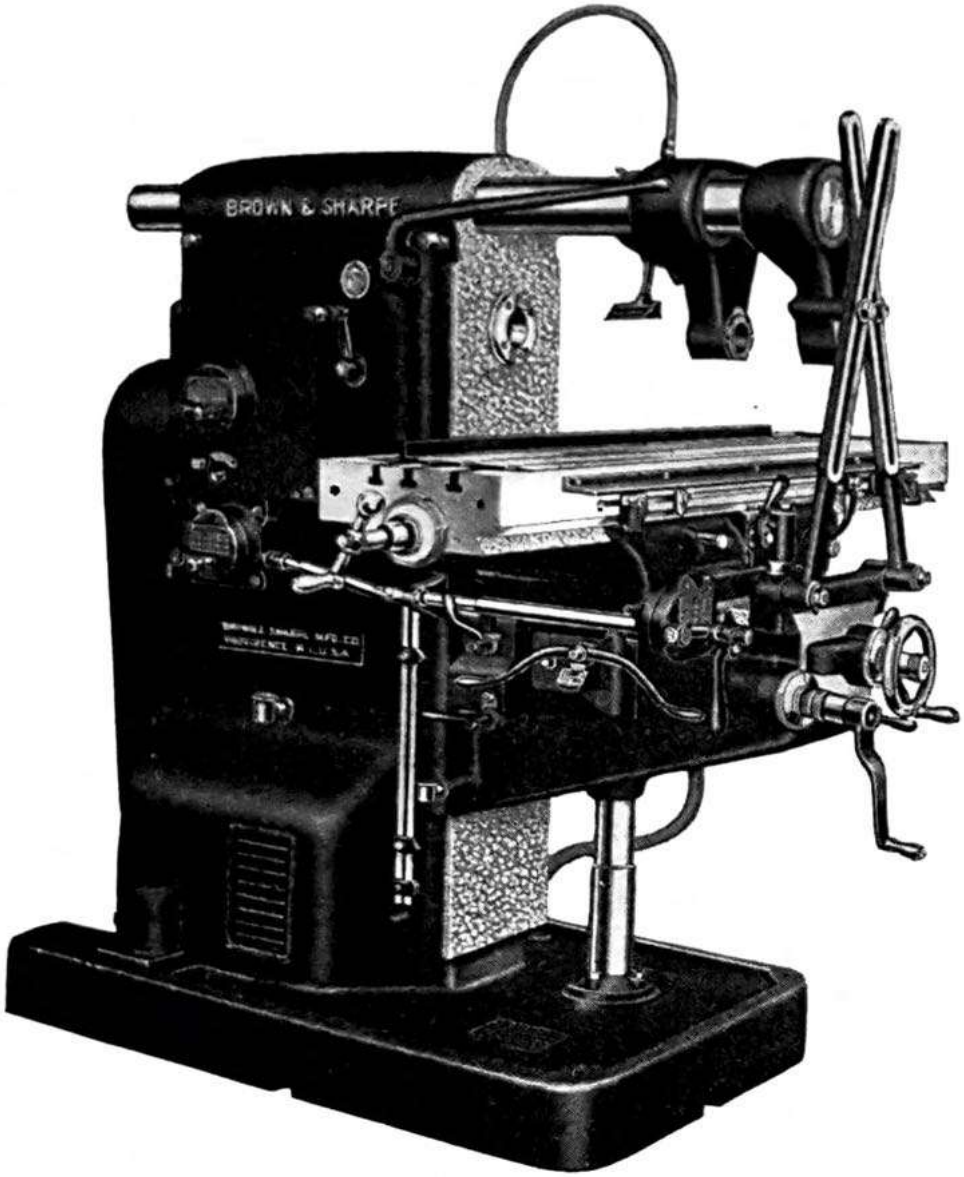


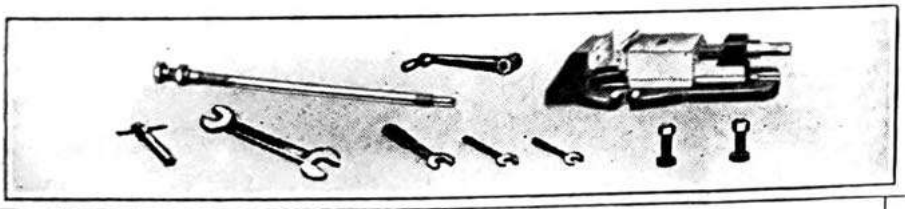
Capacity	Longitudinal feed, automatic	34″
	Transverse feed, automatic	12″
	Vertical feed, automatic	20″
	Power required to operate machine at maximum capacity	7½ H.P.

No. 3B Standard Plain Milling Machine

Capacity	Power longitudinal feed . . . . . inches	34
	Power transverse feed . . . . . inches	12
	Power vertical feed . . . . . inches	20
	Vertical distance, center of spindle to underside of arms . . . . . inches	6 31/64
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	30 3/8
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	22 7/8
	Greatest distance, face of column to arm braces . inches	27 3/8
Table	Overall dimensions . . . . . inches	60 1/4 x 14
	Working surface . . . . . inches	60 1/4 x 14
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	1/2 to 19 7/8
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	50
	Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
	Diameter of driving pulley . . . . . inches	14
	Width of belt . . . . . inches	4
Arbor Bushings	Adjustable for wear . . . . . diam., inches	2 1/8
Coolant Tank	Cast in base . . . . . capacity, gals.	9
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	6 1/8 x 1 9/16 x 3 5/8
Floor Space	Right angles to spindle . . . . . inches	113 1/2
	Parallel to spindle . . . . . inches	78
Weights (Approx.)	Net — Belt drive . . . . . lbs.	5675
	Net — For motor . . . . . lbs.	5875
	Net — With motor . . . . . lbs.	6125
	Shipping — Belt drive . . . . . lbs.	6325
	Shipping — For motor . . . . . lbs.	6525
	Shipping — With motor . . . . . lbs.	6925
Equipment	Coolant system and everything shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley diameter . . . . . inches	14
	Width of belt . . . . . inches	4
	Friction pulley speed . . . . . r.p.m.	350
	Net Weight . . . . . lbs.	230

No. 4B Standard Plain Milling Machine





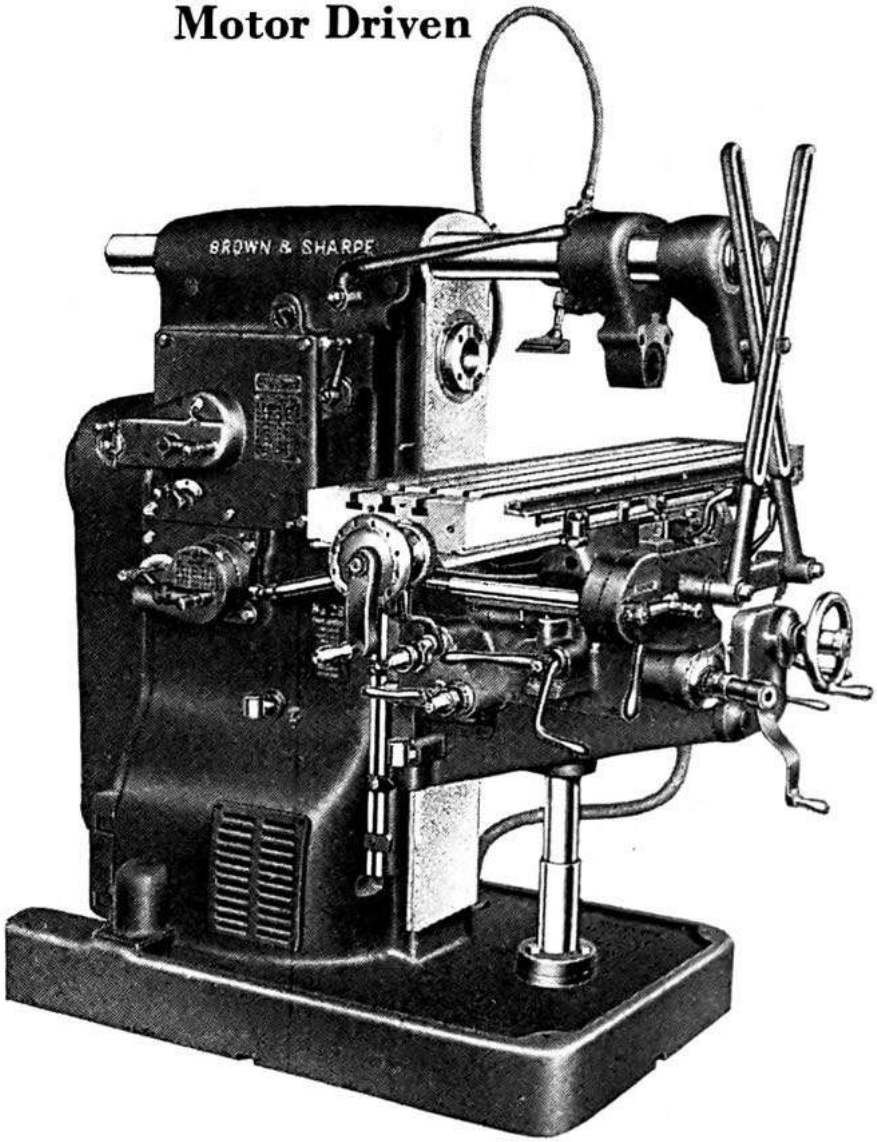
Capacity	Longitudinal feed, automatic	42″
	Transverse feed, automatic	14″
	Vertical feed, automatic	20″
	Power required to operate machine at maximum capacity	10 H.P.

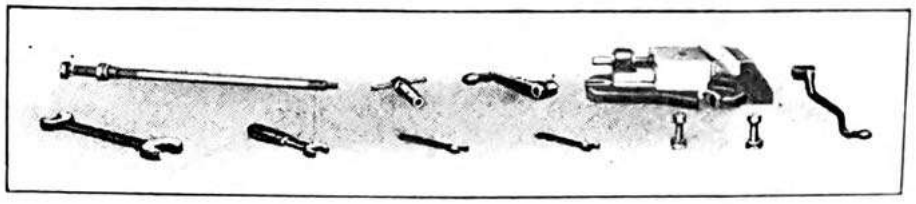
No. 4B Standard Plain Milling Machine

Capacity		Power longitudinal feed . . . . . inches	42
		Power transverse feed . . . . . inches	14
		Power vertical feed . . . . . inches	20
		Vertical distance, center of spindle to underside of arms . . . . . inches	7 21/64
		Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	37 3/4
		Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	28 3/4
		Greatest distance, face of column to arm braces inches	33 1/2
Table		Overall dimensions . . . . . inches	72 x 17
		Working surface . . . . . inches	72 x 17
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size . . . . . inches	11/16
		Number of changes of Feed	16
		Range of Feeds Longitudinal . . . . . In. per min.	1/2 to 19 7/8
		Range of Feeds Trans. & Vert. . . . . In. per min.	3/16 to 7 3/8
		Power Fast Travel Longitudinal . . . . . In. per min.	100
		Power Fast Travel Trans. & Vert. . . . . In. per min.	40
		Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle		Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
		Number of changes of speed	16
		Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive	Motor	By chain and sprockets (dry-disk clutch in sprocket).	
	Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
		Diameter of driving pulley . . . . . inches	15
		Width of belt . . . . . inches	5
Arbor Bushings		Adjustable for wear . . . . . diam., inches	2 3/4
Coolant Tank		Cast in base . . . . . capacity, gals.	16
Vise		Flanged . . . . . Capacity (Width, Depth, Opens) inches	7 1/8 x 2 x 4 1/2
Floor Space		Right angles to spindle . . . . . inches	126 3/4
		Parallel to spindle . . . . . inches	87 1/2
Weights (Approx.)	Net	Belt drive . . . . . lbs.	8125
	Net	For motor . . . . . lbs.	8425
	Net	With motor . . . . . lbs.	8890
	Shipping	Belt drive . . . . . lbs.	9125
	Shipping	For motor . . . . . lbs.	9425
	Shipping	With motor . . . . . lbs.	9890
Equipment		Coolant system and everything shown in cuts.	
		Furnished as Extra—	
Countershaft		Pair tight and loose pulleys . . . . . diam., inches	16
		Width of belt . . . . . inches	5
		Speed . . . . . r.p.m.	420
		Net Weight . . . . . lbs.	350

No. 2B High Speed Plain Milling Machine

Motor Driven





Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	10″
	Vertical feed, automatic	18½″
	Power required to operate machine at maximum capacity	5 H.P.

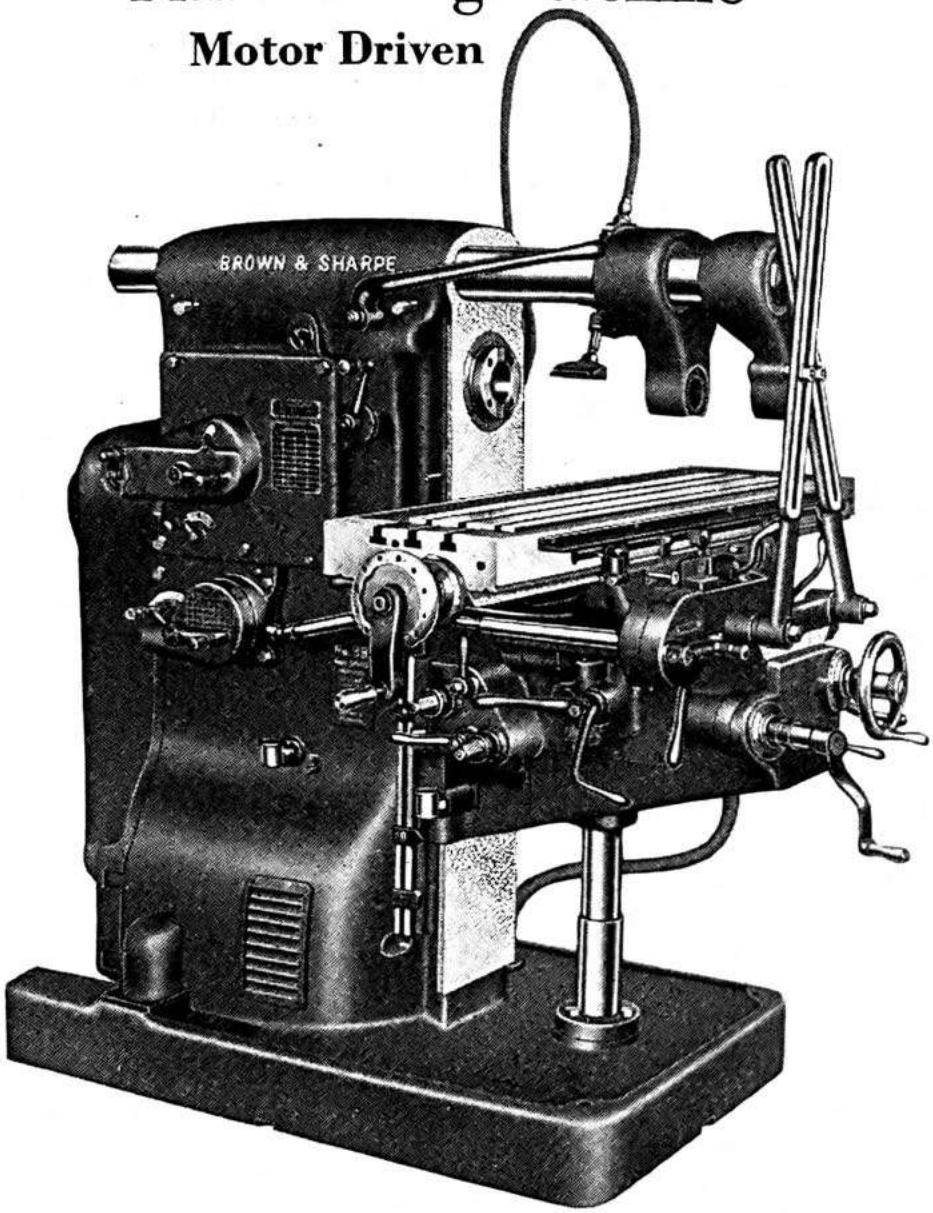
No. 2B High Speed Plain Milling Machine

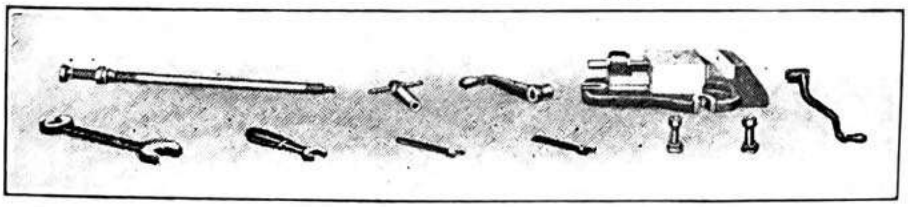
Motor Driven

Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	10
	Power vertical feed . . . . . inches	18½
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	27⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	19¾
	Greatest distance, face of column to arm braces inches	23 9/16
Table	Overall dimensions . . . . . inches	51¾ x 11 11/16
	Working surface . . . . . inches	51¾ x 11 11/16
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	32
	Range of Feeds Longitudinal . . . . . In. per min.	½ to 62
	Range of Feeds Trans. & Vert. . . . . In. per min.	3/16 to 24¾
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	40
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	32
	Range of speeds in either direction . . . . . r.p.m.	20 to 1300
Drive	By constant speed motor through chain and sprockets. Individual built-in motor for operating the power fast travel and coolant pump.	
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	95
	Parallel to spindle . . . . . inches	68½
Weights (Approx.)	Net Fitted for machine driving motor . . . . . lbs.	4650
	Net With motor . . . . . lbs.	4875
	Shipping Fitted for machine driving motor . . . . . lbs.	5125
	Shipping With motor . . . . . lbs.	5350
Equipment	Coolant system, power fast travel motor and everything shown in cuts.	

No. 3B High Speed Plain Milling Machine

Motor Driven



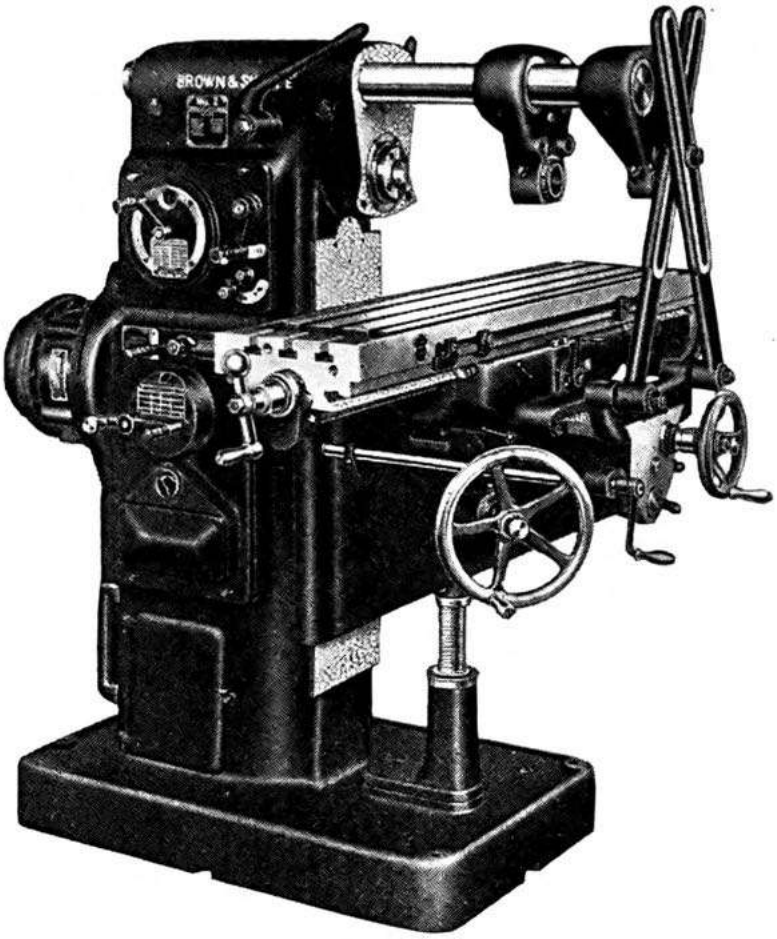


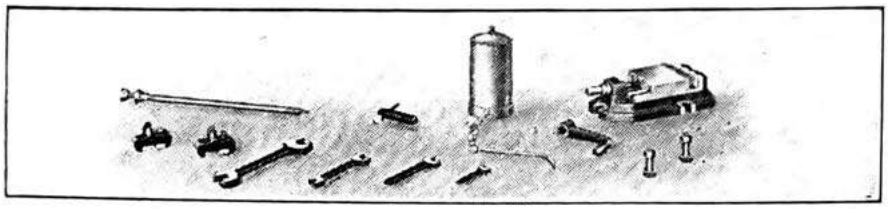
Capacity	Longitudinal feed, automatic	34″
	Transverse feed, automatic	12″
	Vertical feed, automatic	19½″
	Power required to operate machine at maximum capacity	7½ H.P.

No. 3B High Speed Plain Milling Machine
Motor Driven

Capacity	Power longitudinal feed . . . . . inches	34
	Power transverse feed . . . . . inches	12
	Power vertical feed . . . . . inches	19½
	Vertical distance, center of spindle to underside of arms . . . . . inches	6 31/64
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	30⅜
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	22⅞
	Greatest distance, face of column to arm braces inches	27⅜
Table	Overall dimensions . . . . . inches	60¼ x 14
	Working surface . . . . . inches	60¼ x 14
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	32
	Range of Feeds Longitudinal . . . . . In. per min.	½ to 62
	Range of Feeds Trans. & Vert. . . . . In. per min.	3/16 to 24¾
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	40
	Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	32
	Range of speeds in either direction . . . . . r.p.m.	20 to 1300
Drive	By constant speed motor through chain and sprockets. Individual built-in motor for operating the power fast travel and coolant pump.	
Arbor Bushings	Adjustable for wear . . . . . diam., inches	2⅛
Coolant Tank	Cast in base . . . . . capacity, gals.	9
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	113½
	Parallel to spindle . . . . . inches	78
Weights (Approx.)	Net Fitted for machine driving motor . . . . . lbs.	6100
	Net With motor . . . . . lbs.	6400
	Shipping Fitted for machine driving motor . . . . . lbs.	6750
	Shipping With motor . . . . . lbs.	7050
Equipment	Coolant system, power fast travel motor and everything shown in cuts.	

No. 2
Plain Milling Machine
Light Type





Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	10″
	Vertical feed, automatic	15″
	Power required to operate machine at maximum capacity	3 H.P.

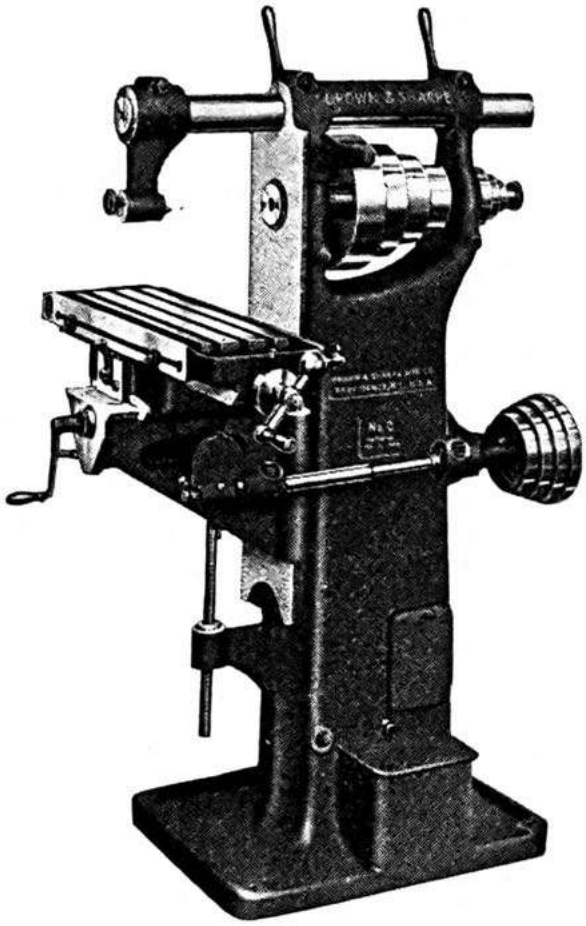
No. 2 Plain Milling Machine
Light Type

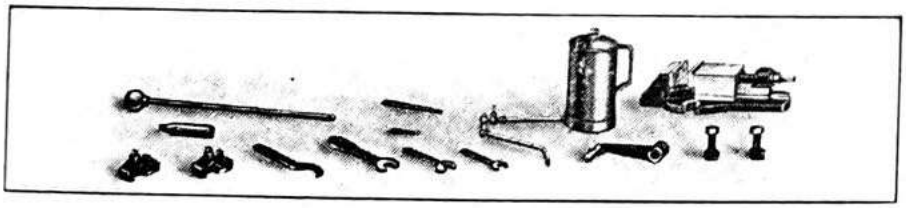
Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	10
	Power vertical feed . . . . . inches	15
	Vertical distance, center of spindle to underside of arms . . . . . inches	4 11/16
	Greatest distance, end of spindle to bushing in outer arbor yoke without arm braces . . . . . inches	17½
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	17½
	Greatest distance, face of column to arm braces inches	24
Table	Overall dimensions . . . . . inches	50½ x 10
	Working surface . . . . . inches	45 x 10
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	½ to 18¼
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 40 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	40 to 1300
Drive	By constant speed flanged type motor (3 H.P.)	
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	1⅞
	Diameter in outer arbor yoke . . . . . inches	23/32
Coolant Tank	Cast in base . . . . . capacity, gals.	6
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	5⅛ x 1¼ x 2¾
Floor Space	Right angles to spindle . . . . . inches	92
	Parallel to spindle . . . . . inches	69
Weights (Approx.)	Net, with motor . . . . . lbs.	2400
	Shipping, with motor . . . . . lbs.	2875
Equipment	Wrenches and everything shown in cuts.	

Furnished as Extra—

Coolant System.

No. 0
Plain Milling Machine
Screw Feed





Capacity	Longitudinal feed, automatic	18″
	Transverse feed	6″
	Vertical feed	15″
	Power required to operate machine at maximum capacity	1 H.P.

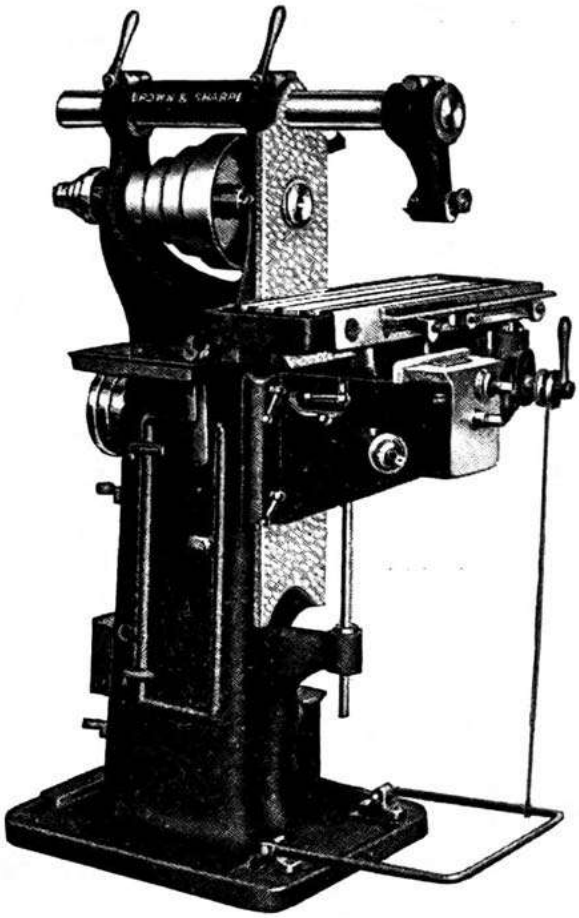
No. 0 Plain Milling Machine

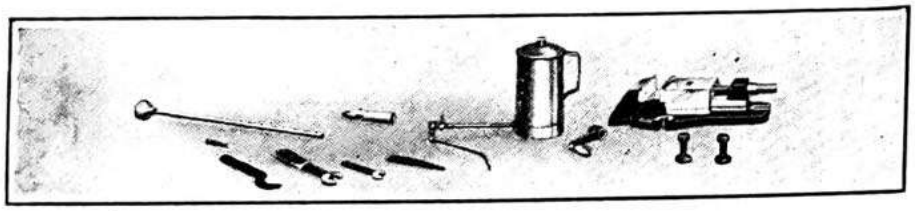
Capacity		Power longitudinal feed . . . . . inches	18
		Hand transverse feed . . . . . inches	6
		Hand vertical feed . . . . . inches	15
		Center of spindle to underside of arm . . . . . inches	5⅛
		Greatest distance, end of spindle to center in support . . . . . inches	12½
Table		Overall dimensions . . . . . inches	29¼ x 8 13/16
		Working surface . . . . . inches	22½ x 8 13/16
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size . . . . . inches	11/16
		Number of changes of Feed	8
		Range of Feeds . . . . . In. per rev. of spindle	.005 to .11
Spindle		Taper hole in front end . . . . . No.	9
		Hole through Spindle . . . . . diam., inches	17/32
		Number of changes of speed	4
		Range of speeds in either direction . . . . . r.p.m.	115 to 460
Drive	Motor	By chain and sprockets, to gear case on spindle.	
	Overhead	Number of steps in cone pulley	4
		Diameter of largest step . . . . . inches	10
		Width of belt . . . . . inches	2¼
Coolant Tank		Cast in base . . . . . capacity, gals.	3½
Collet . . . . . Catalog No.			KK
Vise		Flanged . . . . . Capacity (Width, Depth, Opens) inches	5⅛ x 1¼ x 2¾
Countershaft		Two friction pulleys . . . . . diam., inches	10
		Width of belt . . . . . inches	3
		Speed in either direction . . . . . r.p.m.	230
Floor Space		Right angles to spindle . . . . . inches	60
		Parallel to spindle . . . . . inches	38
Weights (Approx.)	Net	Belt drive Machine . . . . . lbs.	1125
		Belt drive Countershaft . . . . . lbs.	165
		For motor . . . . . lbs.	1225
		With motor . . . . . lbs.	1350
	Shipping	Belt drive (including countershaft) . . . . . lbs.	1550
		For motor . . . . . lbs.	1525
		With motor . . . . . lbs.	1625
Equipment	All machines	Everything shown in cuts.	
	Overhead drive machines	Countershaft.	
	Motor drive machines	Motor bracket, chain, sprockets, gear case and guard. (Motor, wiring and controlling equipment extra.)	

Furnished as Extra—

Coolant System.

No. OY
Plain Milling Machine
Rack Feed





Capacity	Longitudinal feed, automatic	12″
	Transverse feed	6″
	Vertical feed	15″
	Power required to operate machine at maximum capacity	1 H.P.

No. 0Y Plain Milling Machine

Capacity		Power longitudinal feed . . . . . inches	12
		Hand transverse feed . . . . . inches	6
		Hand vertical feed . . . . . inches	15
		Center of spindle to underside of arm . . . . . inches	5⅛
		Greatest distance, end of spindle to center in support . . . . . inches	12½
Table		Overall dimensions . . . . . inches	29 x 8 13/16
		Working surface . . . . . inches	22 x 8 13/16
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size . . . . . inches	11/16
		Number of changes of Feed	8
		Range of Feeds . . . . . In. per rev. of spindle.	.005 to .107
		Longitudinal Power Fast Travel . . . . . In. per min.	300
Spindle		Taper hole in front end . . . . . No.	9
		Hole through spindle . . . . . diam., inches	17/32
		Number of changes of speed	4
		Range of speeds in either direction . . . . . r.p.m.	115 to 460
Drive	Motor	By chain and sprockets, to gear case on spindle.	
	Overhead	Number of steps in cone pulley	4
		Diameter of largest step . . . . . inches	10
		Width of belt . . . . . inches	2¼
Coolant Tank		Cast in base . . . . . capacity, gals.	3½
Collet . . . . . Catalog No.			KK
Vise		Flanged . . . . . Capacity (Width, Depth, Opens) inches	4⅛ x 1 1/16 x 2
Countershaft		Two friction pulleys . . . . . diam., inches	10
		Width of belt . . . . . inches	3
		Speed in either direction . . . . . r.p.m.	230
Floor Space		Right angles to spindle . . . . . inches	47
		Parallel to spindle . . . . . inches	38
Weights (Approx.)	Net	Belt drive: Machine . . . . . lbs.	1150
		Belt drive: Countershaft . . . . . lbs.	165
		For motor . . . . . lbs.	1250
		With motor . . . . . lbs.	1375
	Shipping	Belt drive (including countershaft) . . . . . lbs.	1600
		For motor . . . . . lbs.	1550
		With motor . . . . . lbs.	1650
Equipment	All machines	Everything shown in cuts.	
	Overhead drive machines	Countershaft.	
	Motor drive machines	Motor bracket, chain, sprockets, gear case and guard. (Motor, wiring and controlling equipment extra.)	

Furnished as Extra—

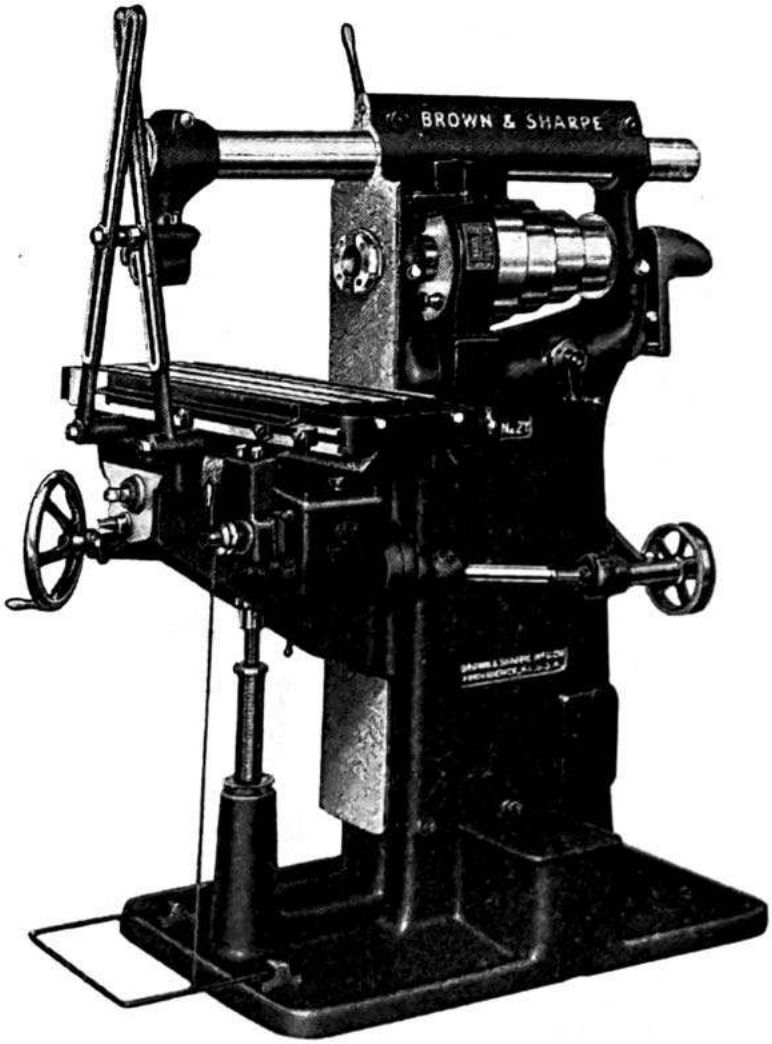
Coolant System

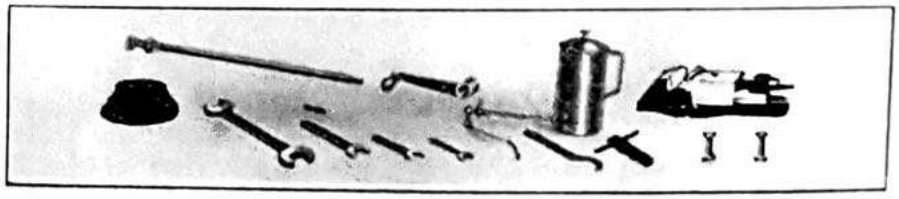
The outstanding feature of this machine is the semi-automatic control of the table which equips the machine exceptionally well for fast production of duplicate parts.

A foot treadle at the front of the machine controls the mechanism operating the power fast travel of the table. By depressing this treadle the work in the vise or fixture is brought quickly to the cutters, where an adjustable dog engages the cutting feed. When desired the power fast travel can be tripped by a hand lever instead of the foot treadle. This makes it impossible to jam the work into the cutters, prevents broken cutters and eliminates lost time. At the completion of the cut a second dog releases the feed and the table returns automatically to the loading position.

This table control permits the work to be carried rapidly to the cutting position. If the cutting and loading time are short, a material increase in production can be obtained. If the loading time is shorter than the cutting time, the automatic table return permits the operator to run two machines.

Nos. 1Y and 2Y
Plain Milling Machines
Rack Feed





No. 2Y shown

		No. 1Y	No. 2Y
Capacity	Longitudinal feed, automatic	24″	24″
	Transverse feed	6½″	6½″
	Vertical feed	18½″	18½″
	Power required to operate machine at maximum capacity	1½ H.P.	2 H.P.

Nos. 1Y and 2Y Plain Milling Machines

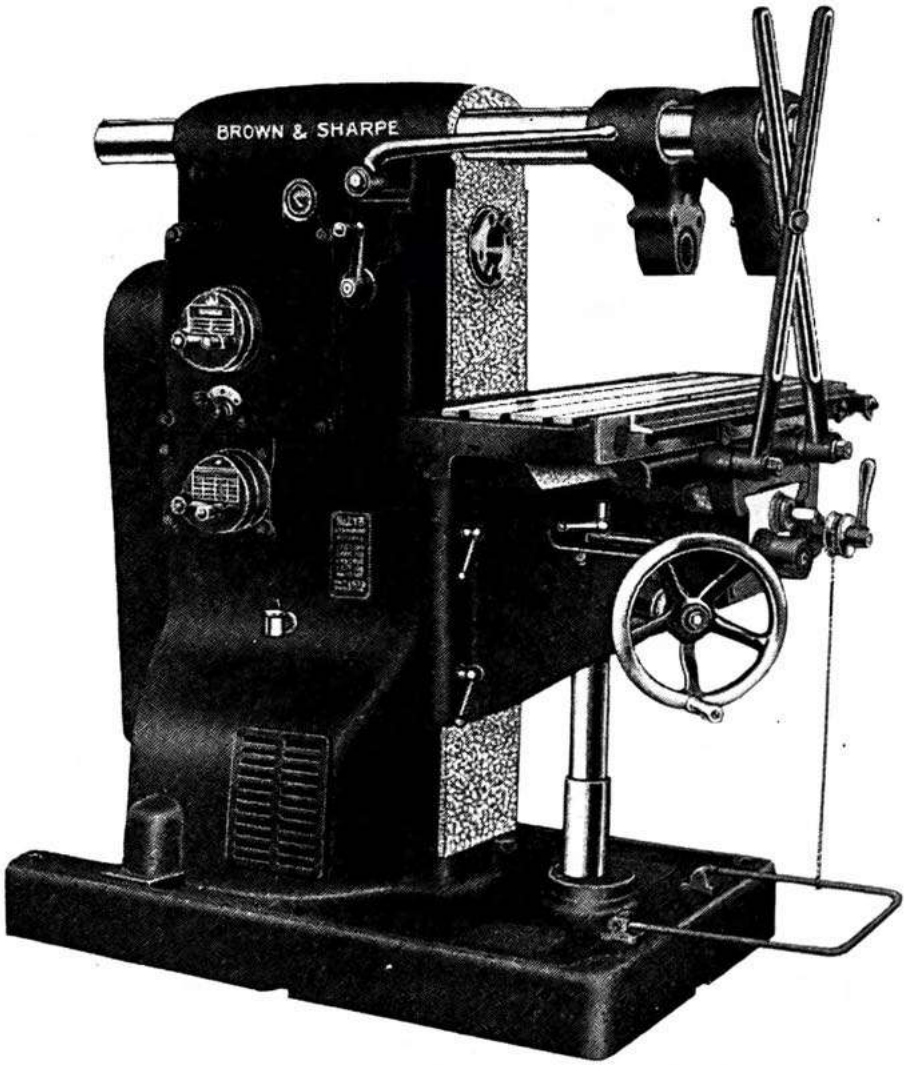
		No. 1Y	No. 2Y
Capacity	Power longitudinal feed . . . . . inches	24	24
	Hand transverse feed . . . . . inches	6½	6½
	Hand vertical feed . . . . . inches	18½	18½
	Center of spindle to underside of arm . . . . . inches	5½	5½
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	18¼	18¼
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	13½	13½
	Greatest distance, face of column to arm braces . . . . . inches	18¼	18¼
Table	Overall dimensions . . . . . inches	42 x 11	42 x 11
	Working surface . . . . . inches	34 x 11	34 x 11
	T-slots (Standardized) Number	3	3
	T-slots (Standardized) Size . . . . . inches	11/16	11/16
	Number of changes of Feed	16	16
	Range of Feeds . . . . . In. per min.	½ to 19½	½ to 19½
	Longitudinal Power Fast Travel . . . . . In. per min.	300	300
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.		
	Number of changes of speed	5	8
	Range of speeds . . . . . r.p.m.	75 to 430	25 to 419
Drive	Number of steps in cone pulley	5	4
	Diameter of largest step . . . . . inches	10¾	10
	Width of belt . . . . . inches	3	3
Arbor Bushings (adjustable for wear)	Diameter of larger hole in arbor yoke . . . . . inches	2⅛	2⅛
	Diameter of smaller hole in arbor yoke . . . . . inches	23/32	23/32
Coolant Tank	Cast in base . . . . . capacity, gals.	7	7
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) . . . . . inches	5⅛ x 1¼ x 2¾	6⅛ x 1 9/16 x 3⅝
Countershaft	Friction pulley . . . . . diam., inches	12	14
	Width of belt . . . . . inches	3	3½
	Speed . . . . . r.p.m.	180	230
Floor Space	Right angles to spindle . . . . . inches	70	70
	Parallel to spindle . . . . . inches	54	54
Weights (Approx.)	Net: Machine . . . . . lbs.	2175	2350
	Net: Countershaft . . . . . lbs.	225	235
	Shipping: Machine and countershaft . . lbs.	2750	3000
Equipment	Countershaft and everything shown in cuts.		

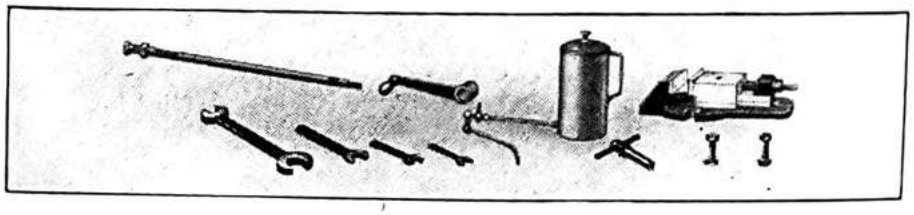
Furnished as Extra—

Coolant System.

No. 2YB Standard Plain Milling Machine

Rack Feed



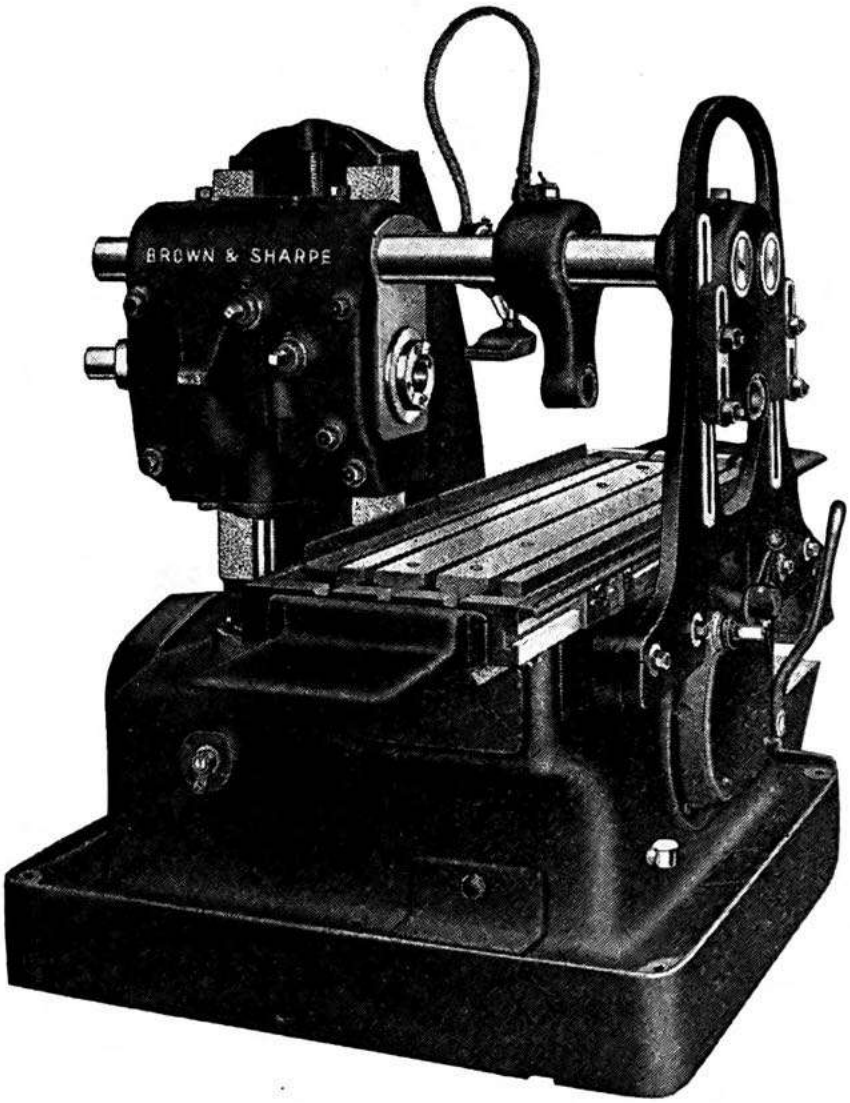


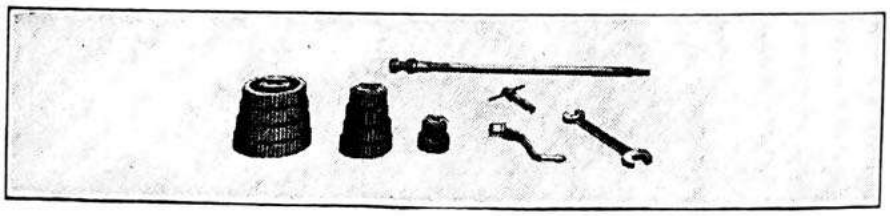
Capacity	Longitudinal feed, automatic	24″
	Transverse feed	6½″
	Vertical feed	18″
	Power required to operate machine at maximum capacity	3 H.P.

No. 2YB Standard Plain Milling Machine

Capacity	Power longitudinal feed . . . . . inches	24
	Hand transverse feed . . . . . inches	6½
	Hand vertical feed . . . . . inches	18
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to bushing in arbor yoke without arm braces . . . . . inches	18¼
	Greatest distance, end of spindle to arbor bushing with arm braces . . . . . inches	13½
	Greatest distance, face of column to arm braces . inches	18¼
Table	Overall dimensions . . . . . inches	42 x 11
	Working surface . . . . . inches	34 x 11
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	9/16 to 21 9/16
	Longitudinal Power Fast Travel . . . . . In. per min.	318
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	21 to 496
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
	Diameter of driving pulley . . . . . inches	12
	Width of belt . . . . . inches	3
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Vise	Flanged. . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	70
	Parallel to spindle . . . . . inches	58¼
Weights (Approx.)	Net — Belt drive . . . . . lbs.	4150
	Net — For motor . . . . . lbs.	4225
	Net — With motor . . . . . lbs.	4450
	Shipping — Belt drive . . . . . lbs.	4625
	Shipping — For motor . . . . . lbs.	4700
	Shipping — With motor . . . . . lbs.	4925
Equipment	Everything shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley diameter . . . . . inches	12
	Width of belt . . . . . inches	3½
	Friction pulley speed . . . . . r.p.m.	386
	Net Weight . . . . . lbs.	200
Coolant System.		

No. 13
Plain Milling Machine



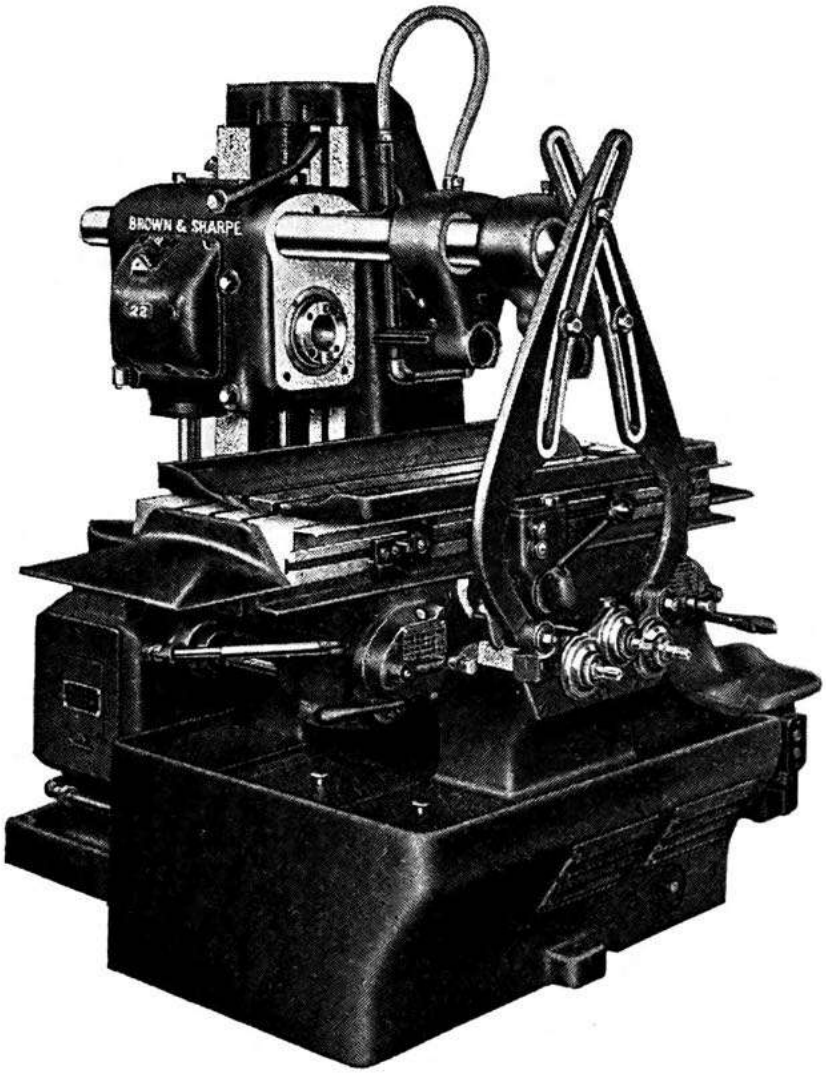


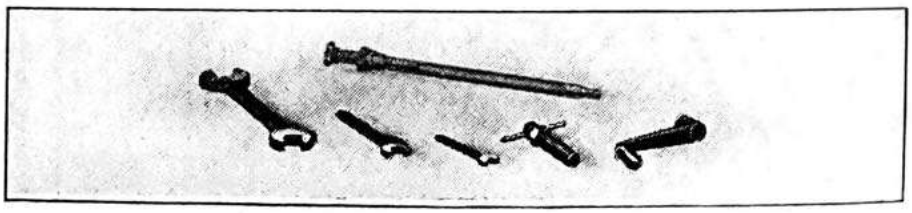
Capacity	Longitudinal feed of table, automatic.....	34″
	Transverse adjustment of spindle.....	4″
	Vertical adjustment of spindle head.....	12″
	Power required to operate machine at maximum capacity.....	7½ H.P.

No. 13 Plain Milling Machine

Capacity	Power longitudinal feed . . . . . inches	34
	Transverse adjustment of spindle . . . . . inches	4
	Vertical adjustment of spindle head . . . . . inches	12
	Vertical distance, center of spindle to underside of arms . . . . . inches	6 13/16
	Greatest distance, end of spindle to bushing in arbor yoke without arm brace . . . . . inches	24
	Greatest distance, end of spindle to bushing in arbor yoke with arm brace . . . . . inches	20 3/8
	Greatest distance, face of spindle head to arm brace . . . . . inches	21 5/8
	Distance, top of table to center of spindle { Greatest . . . . . inches	14
	Distance, top of table to center of spindle { Least . . . . . inches	2
Table	Overall dimensions . . . . . inches	55 x 17 13/16
	Working surface . . . . . inches	55 x 17 13/16
	T-slots (Standardized) { Number	3
	T-slots (Standardized) { Size . . . . . inches	13/16
	Number of changes of Feed	8
	Range of Feeds in either direction . . . . . In. per min.	1 1/2 to 15.3
	Power Fast Travel in either direction . . . . In. per min.	175
	Height, floor to top of table . . . . . inches	32
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	6
	Range of speeds in either direction . . . . . r.p.m.	25.8 to 253
Drive — Motor	By bevel pinion and gear (dry-disk clutch in gear).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	500
	Diameter of driving pulley . . . . . inches	15
	Width of double belt . . . . . inches	5
Arbor Bushings	Adjustable for wear . . . . . diam., inches	2 1/8
Coolant Tank	Cast in base . . . . . capacity, gals.	40
Floor Space	Right angles to spindle . . . . . inches	111 3/4
	Parallel to spindle . . . . . inches	63 3/4
Weights (Approx.)	Net { Belt drive . . . . . lbs.	6900
	Net { For motor . . . . . lbs.	7100
	Net { With motor . . . . . lbs.	7350
	Shipping { Belt drive . . . . . lbs.	7550
	Shipping { For motor . . . . . lbs.	7750
	Shipping { With motor . . . . . lbs.	8000
Equipment	Coolant system and everything shown in cuts.	
	Furnished as Extra—	
Countershaft	Pair tight and loose pulleys . . . . . diam., inches	16
	Width of belt . . . . . inches	5
	Speed . . . . . r.p.m.	470
	Net Weight . . . . . lbs.	250

No. 22
Plain Milling Machine





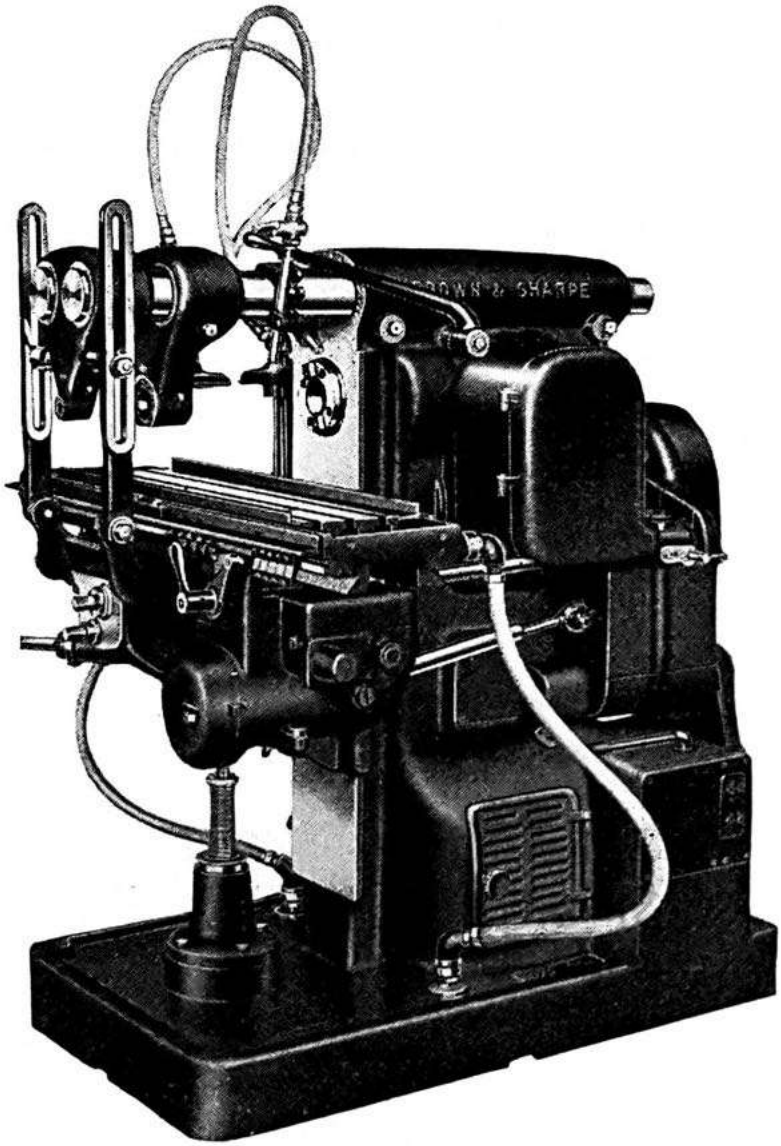
Capacity	Longitudinal feed, automatic	22″
	Transverse adjustment of saddle	6″
	Vertical adjustment of spindle head	13″
	Power required to operate machine at maximum capacity	7½ H.P.

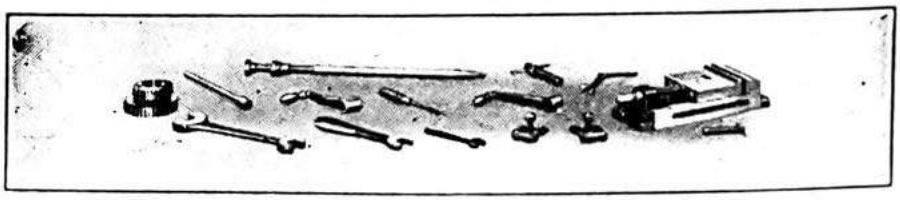
No. 22 Plain Milling Machine

Capacity		Power longitudinal feed ..... inches	22
		Transverse adjustment of saddle ..... inches	6
		Vertical adjustment of spindle head ..... inches	13
		Vertical distance, center of spindle to underside of arms ..... inches	5¾
		Greatest distance, end of spindle to bushing in arbor yoke without arm braces ..... inches	26¾
		Greatest distance, end of spindle to bushing in arbor yoke with arm braces ..... inches	20⅜
		Greatest distance, face of head to arm braces .... inches	24¾
		Distance, top of table to center of spindle: Greatest ..... inches	14¼
		Distance, top of table to center of spindle: Least ..... inches	1¼
Table		Overall dimensions ..... inches	46 x 15⅛
		Working surface ..... inches	46 x 15⅛
		T-slots (Standardized) Number	3
		T-slots (Standardized) Size ..... inches	11/16
		Number of changes of Feed	16
		Range of Feeds in either direction ..... In. per min.	1 to 38½
		Power Fast Travel in either direction ..... In. per min.	191
		Height, floor to top of table ..... inches	33
Spindle		Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
		Number of changes of speed	16
		Range of speeds in either direction ..... r.p.m.	25 to 620
Drive	Motor	By chain and sprockets (dry-disk clutch in sprocket).	
	Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	500
		Diameter of driving pulley ..... inches	12
		Width of belt ..... inches	3
Arbor Bushings		Adjustable for wear ..... diam., inches	2⅛
Coolant Tank		Cast in base ..... capacity, gals.	15
Floor Space		Right angles to spindle ..... inches	86
		Parallel to spindle ..... inches	58
Weights (Approx.)	Net	Belt drive ..... lbs.	5550
		For motor ..... lbs.	5750
		With motor ..... lbs.	6000
	Shipping	Belt drive ..... lbs.	6250
		For motor ..... lbs.	6450
		With motor ..... lbs.	6700
Equipment		Coolant system and everything shown in cuts.	
		Furnished as Extra—	
Countershaft		Friction pulley ..... diam., inches	12
		Width of belt ..... inches	3
		Speed ..... r.p.m.	500
		Net Weight ..... lbs.	200
Fixture Flushing Pump ..... No.			22

Longer Table with 32″ power longitudinal feed.

No. 21
Automatic Milling Machine



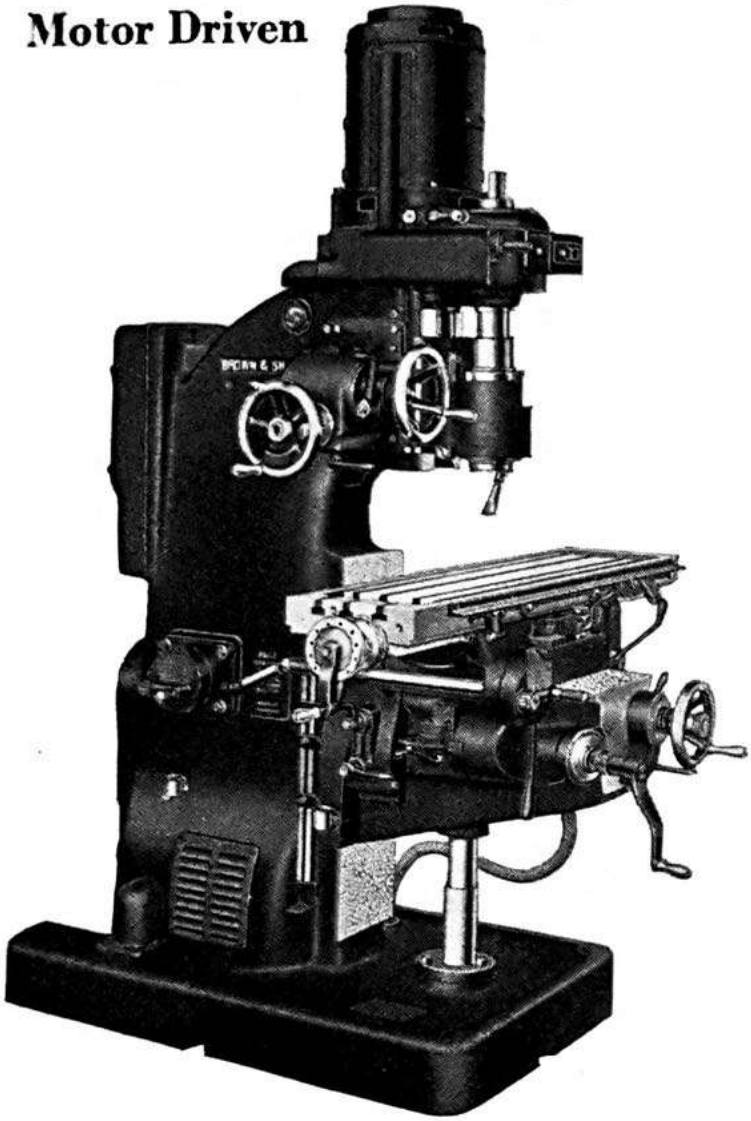


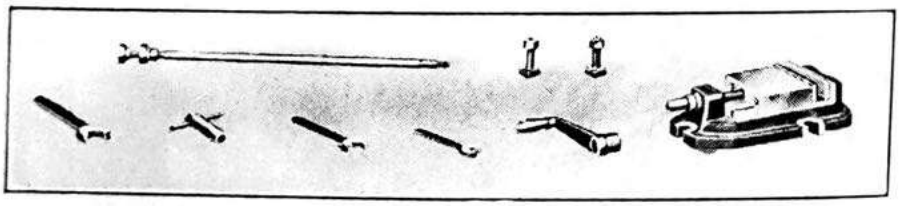
Capacity	Longitudinal feed, automatic	22″
	Transverse adjustment	6½″
	Vertical adjustment	14½″
	Power required to operate machine at maximum capacity	3 H.P.

No. 21 Automatic Milling Machine

Capacity	Power longitudinal feed . . . . . inches	22
	Transverse adjustment of table . . . . . inches	6½
	Vertical adjustment of table . . . . . inches	14½
	Vertical distance, center of spindle to underside of arms . . . . . inches	5¾
	Greatest distance, end of spindle to arbor bushing, with or without arm braces . . . . . inches	19¼
	Greatest distance, face of column to arm braces . inches	20
Table	Overall dimensions . . . . . inches	44¼ x 11
	Working surface . . . . . inches	34 x 11
	T-slots { Number	3
	T-slots { Size . . . . . inches	⅝
	Number of changes of Feed	12
	Range of Feeds in either direction . . . . . In. per min.	1.37 to 18.38
	Power Fast Travel in either direction . . . . . In. per min.	210
	Shortest table movement using power fast travel . inches	⅞
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	16
	Range of speeds in either direction . . . . . r.p.m.	28 to 695
Drive — Motor	By chain and sprockets (friction clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing friction clutch) r.p.m.	300
	Diameter of driving pulley . . . . . inches	12
	Width of belt . . . . . inches	3
Arbor Bushings (adjustable for wear)	Diameter in inner arbor yoke . . . . . inches	2⅛
	Diameter in outer arbor yoke . . . . . inches	23/32
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to spindle . . . . . inches	66
	Parallel to spindle . . . . . inches	61
Weights (Approx.)	Net { Belt drive . . . . . lbs.	4100
	Net { For motor . . . . . lbs.	4300
	Net { With motor . . . . . lbs.	4400
	Shipping { Belt drive . . . . . lbs.	4600
	Shipping { For motor . . . . . lbs.	4800
	Shipping { With motor . . . . . lbs.	4900
Equipment	Coolant system and everything shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley . . . . . diam., inches	12
	Width of belt . . . . . inches	3½
	Speed . . . . . r.p.m.	325
	Net Weight . . . . . lbs.	190

No. 1 Standard
Vertical Spindle Milling Machine
Motor Driven





Capacity	Longitudinal feed, automatic	22″
	Transverse feed, automatic	10″
	Vertical feed { Knee, automatic	14″
	Vertical feed { Spindle head, automatic	4″
	Power required to operate machine at maximum capacity	1¾ H.P.

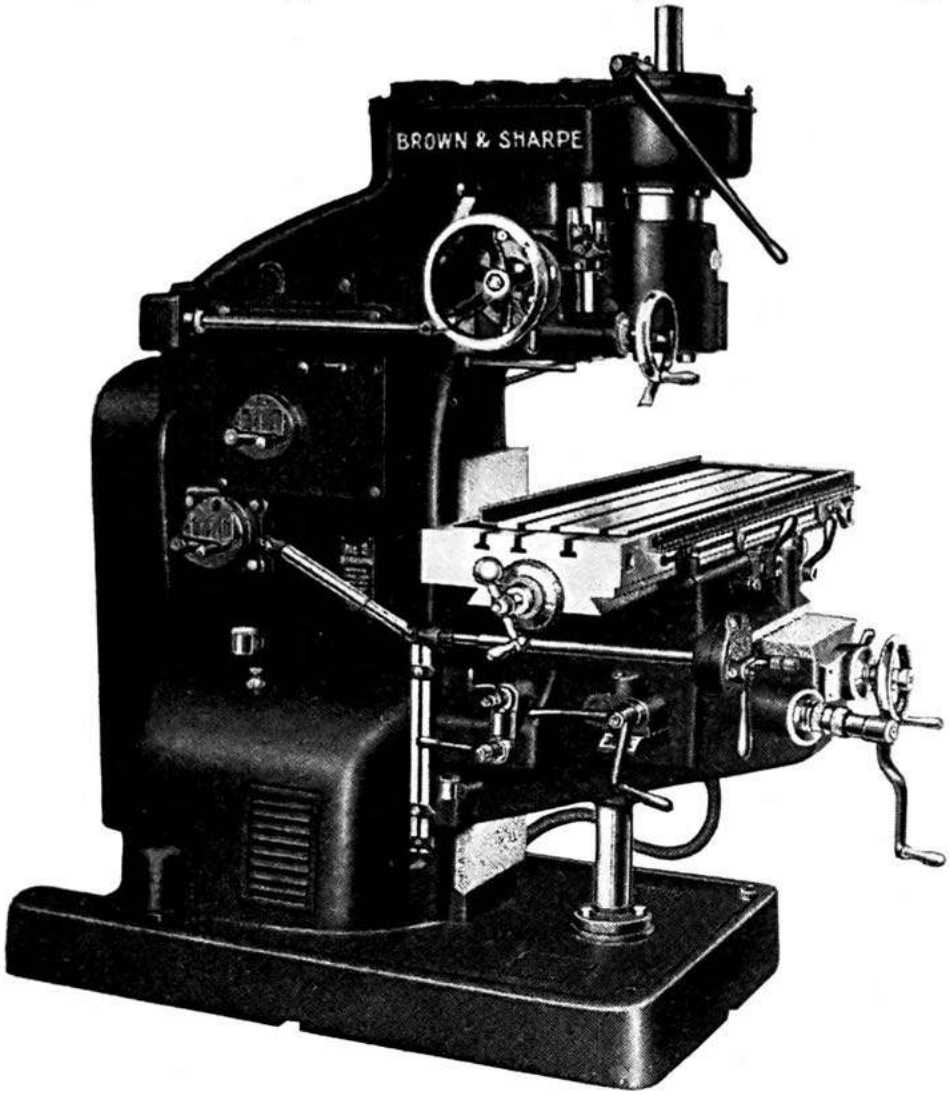
No. 1 Standard Vertical Spindle Milling Machine

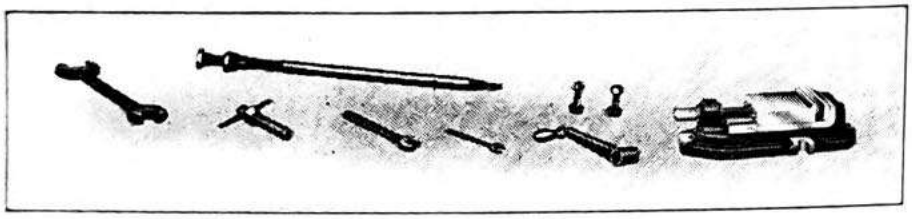
Motor Driven

Capacity	Power longitudinal feed . . . . . inches	22
	Power transverse feed . . . . . inches	10
	Power vertical feed of knee . . . . . inches	14
	Power vertical feed of spindle head . . . . . inches	4
	Greatest distance, end of spindle to top of table inches	18
	Distance, center of spindle to throat of column inches	14
Table	Overall dimensions . . . . . inches	42¾ x 11¼
	Working surface . . . . . inches	42¾ x 11¼
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	½ to 19⅞
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	50
	Provision for driving 18″ Rotary Attachment.	
Spindle	Hardened and ground. Has Standardized End. No. 40 Milling Machine Standard taper hole.	
	Number of changes of speed	8
	Range of speeds in either direction . . . . . r.p.m.	150 to 1800
Spindle Head	Number of changes of Feed	16
	Range of Feeds . . . . . In. per min.	⅜ to 13½
Drive	Spindle Drive—4 speed, constant H.P. type motor (1 H.P.) with drum type control.	
	Feed Drive—Constant speed type motor (¾ H.P.) furnishes power for table feeds and vertical feed of spindle head.	
Coolant Tank	Cast in base . . . . . capacity, gals.	8
Vise	Flanged. . . . . Capacity (Width, Depth, Opens) inches	5⅛ x 1¾ x 2¾
Floor Space	Right angles to table . . . . . inches	68
	Parallel to table . . . . . inches	77
Weights (Approx.)	Net Fitted for feed driving motor . . . . . lbs.	4275
	Net With motor . . . . . lbs.	4340
	Shipping Fitted for feed driving motor . . . . . lbs.	4800
	Shipping With motor . . . . . lbs.	4865
Equipment	Coolant system and everything shown in cuts.	

Due to the type of spindle construction, this machine is *always* furnished equipped with spindle motor.

Nos. 2 Standard and 3 Standard Vertical Spindle Milling Machines





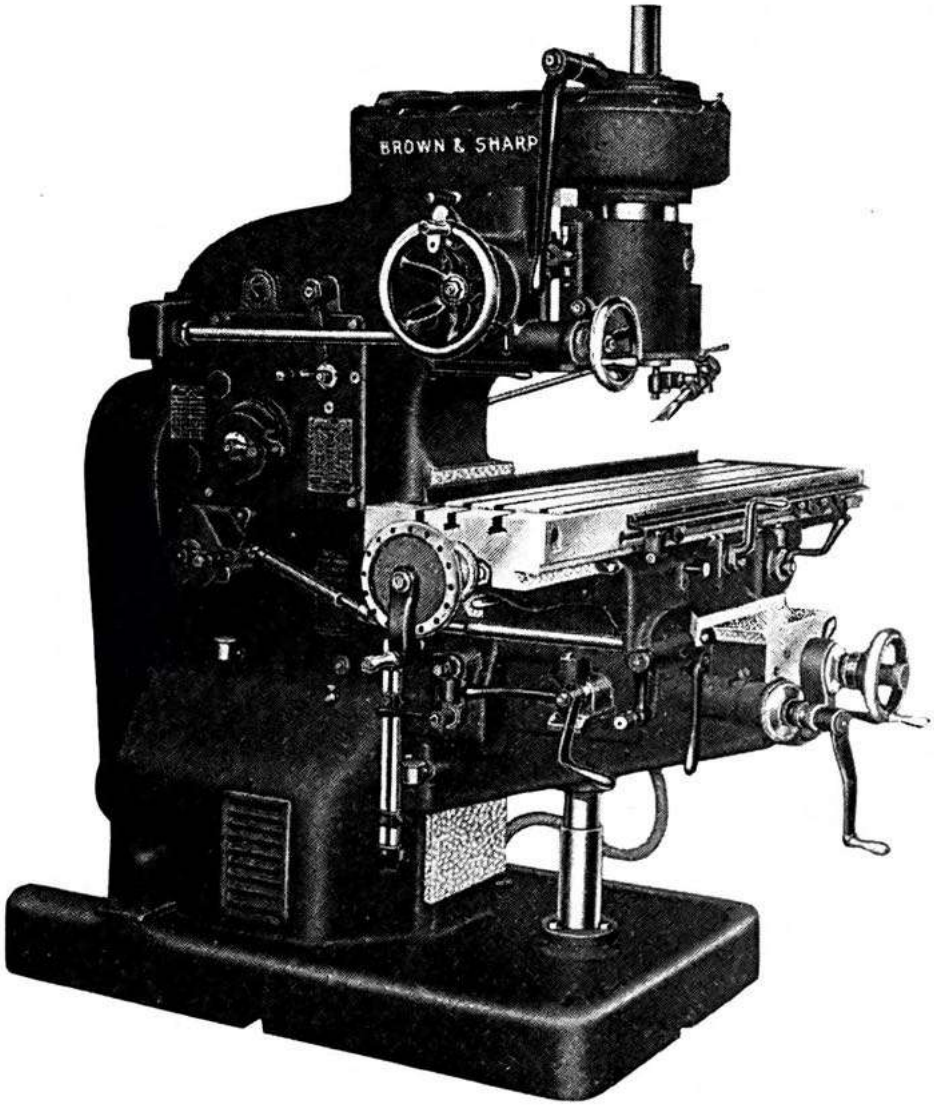
No. 2 shown

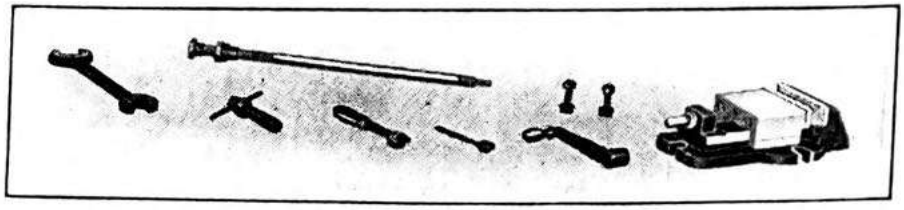
		No. 2	No. 3
Capacity	Longitudinal feed, automatic	28″	34″
	Transverse feed, automatic	12″	14″
	Vertical feed: Knee, automatic	14″	13¼″
	Vertical feed: Spindle head, automatic	6″	8″
	Power required to operate machine at maximum capacity	7½ H.P.	10 H.P.

Nos. 2 Std. and 3 Std. Vertical Spindle Milling Machines

		No. 2	No. 3
Capacity	Power longitudinal feed . . . . . .inches	28	34
	Power transverse feed . . . . . .inches	12	14
	Power vertical feed of knee. . . . .inches	14	13¼
	Power vertical feed of spindle head . . . . . .inches	6	8
	Greatest distance, end of spindle to top of table . . . . . .inches	20	22
	Distance, center of spindle to throat of column . . . . . .inches	16¼	18½
Table	Overall dimensions . . . . . .inches	54¼ x 14	64 x 17
	Working surface . . . . . .inches	54¼ x 14	64 x 17
	T-slots (Standardized) Number	3	3
	T-slots (Standardized) Size . . . .inches	11/16	13/16
	Number of changes of Feed	16	16
	Range of Feeds Longitudinal . . .In. per min.	½ to 19⅞	½ to 19⅞
	Range of Feeds Trans. & Vert. .In. per min.	3/16 to 7⅞	3/16 to 7⅞
	Power Fast Travel Longitudinal .In. per min.	100	100
	Power Fast Travel Trans.&Vert..In. per min.	40	40
	Provision for driving 18″ and 26″ Rotary Attachments.		
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.		
	Number of changes of speed	16	16
	Range of speeds in either direction . . . . . .r.p.m.	21 to 496	21 to 496
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).		
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) . . . . . .r.p.m.	450	450
	Diameter of driving pulley . . . . .inches	14	15
	Width of belt. . . . . .inches	4	5
Coolant Tank	Cast in base . . . . . .capacity, gals.	9	16
Vise	Flanged . . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝	7⅛ x 2 x 4½
Floor Space	Right angles to table . . . . . .inches	78	96
	Parallel to table . . . . . .inches	101½	111
Weights (Approx.)	Net — Belt drive . . . . . .lbs.	5800	8250
	Net — For motor . . . . . .lbs.	5825	8600
	Net — With motor . . . . . .lbs.	6225	9275
	Shipping — Belt drive . . . . . .lbs.	6625	9250
	Shipping — For motor . . . . . .lbs.	6625	9750
	Shipping — With motor . . . . . .lbs.	7000	10425
Equipment	Coolant system and everything shown in cuts.		
	Furnished as Extra—		
Countershaft	Friction pulley diameter . . . . . .inches	14	16
	Width of belt. . . . . .inches	4	5
	Speed . . . . . .r.p.m.	350	420
	Net Weight . . . . . .lbs.	240	360

No. 2 High Speed Vertical Spindle Milling Machine





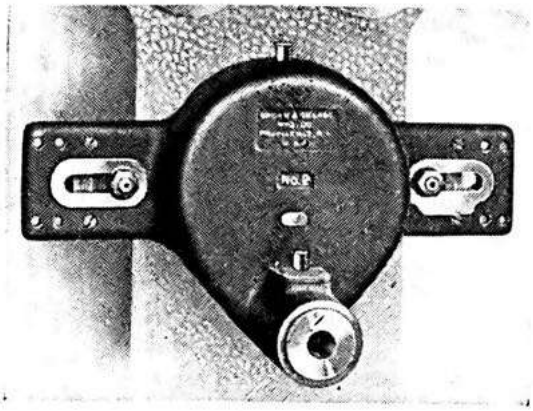
Capacity	Longitudinal feed, automatic	28″
	Transverse feed, automatic	12″
	Vertical feed { Knee, automatic	14″
	Vertical feed { Spindle head, automatic	6″
	Power required to operate machine at maximum capacity	7½ H.P.

No. 2 High Speed Vertical Spindle Milling Machine

Capacity	Power longitudinal feed . . . . . inches	28
	Power transverse feed . . . . . inches	12
	Power vertical feed of knee . . . . . inches	14
	Power vertical feed of spindle head . . . . . inches	6
	Greatest distance, end of spindle to top of table . inches	20
	Distance, center of spindle to throat of column . inches	16¼
Table	Overall dimensions . . . . . inches	54¼ x 14
	Working surface . . . . . inches	54¼ x 14
	T-slots (Standardized) Number	3
	T-slots (Standardized) Size . . . . . inches	11/16
	Number of changes of Feed	32
	Range of Feeds Longitudinal . . . . . In. per min.	7/16 to 62
	Range of Feeds Trans. & Vert. . . . . In. per min.	3/16 to 24¾
	Power Fast Travel Longitudinal . . . . . In. per min.	100
	Power Fast Travel Trans. & Vert. . . . . In. per min.	40
	Provision for driving 18″ and 26″ Rotary Attachments.	
Spindle	Hardened and ground. Has Standardized End. No. 50 Milling Machine Standard taper hole.	
	Number of changes of speed	32
	Range of speeds in either direction . . . . . r.p.m.	20 to 1300
Drive — Motor	By chain and sprockets (dry-disk clutch in sprocket).	
Drive — Overhead	Speed of driving pulley (containing dry-disk clutch) r.p.m.	450
	Diameter of driving pulley . . . . . inches	14
	Width of belt . . . . . inches	4
Coolant Tank	Cast in base . . . . . capacity, gals.	9
Vise	Flanged. . . . . Capacity (Width, Depth, Opens) inches	6⅛ x 1 9/16 x 3⅝
Floor Space	Right angles to table . . . . . inches	78
	Parallel to table . . . . . inches	101½
Weights (Approx.)	Net — Belt drive . . . . . lbs.	5700
	Net — For motor . . . . . lbs.	5950
	Net — With motor . . . . . lbs.	6350
	Shipping — Belt drive . . . . . lbs.	6225
	Shipping — For motor . . . . . lbs.	6475
	Shipping — With motor . . . . . lbs.	6875
Equipment	Coolant system and everything shown in cuts.	
	Furnished as Extra—	
Countershaft	Friction pulley diameter . . . . . inches	14
	Width of belt . . . . . inches	4
	Speed . . . . . r.p.m.	350
	Net Weight . . . . . lbs.	240

Nos. 1 and 2
High Speed Milling Attachments

When ordering, give size and serial number of machine.



It is often necessary when milling such work as key ways and slots, die-making, etc., to use a small cutter which should be run more rapidly than provided for by the fastest spindle speed available on the machine. In order to obtain correct speeds for these small mills and thus secure high production it is necessary to employ one of these attachments.

The attachment is securely clamped to the face of the column which affords a large bearing surface. The mechanism is enclosed and protected from dirt and injury. As many speed changes are available as can be obtained for the main spindle of the machine.

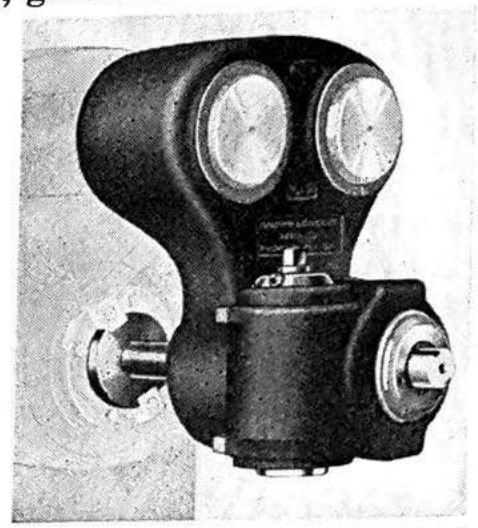
The driving gear is bolted to the face of the standardized spindle and is driven by the keys. It meshes with a pinion on the spindle of the attachments.

No. of Att.	Machine where used	No. of B. & S. Taper Hole in Spindle	Net Wt., Lbs.	Shipping Wt.. Lbs.
1	No. 1A Standard Universal No. 2A Standard Universal No. 1Y Plain (Begins No. 1963) No. 1B Standard Plain No. 2Y Plain (Begins No. 3774) No. 2B Standard Plain No. 2YB Standard Plain No. 21 Automatic (Begins No. 143)	7	38	52
2	No. 3A Standard Universal No. 4A Standard Universal No. 3B Standard Plain No. 4B Standard Plain	9	70	105

Ratio of Attachment Spindle to Machine Spindle, 4½ to 1 on No. 1; 4 to 1 on No. 2.
Attachment suitable for speeds to 2000 R.P.M.
In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

Nos. 0, 1 and 2
Vertical Milling Attachments

When ordering, give size and serial number of machine.



The Vertical Milling Attachments are particularly advantageous on work where it is better to hold the piece in a horizontal position.

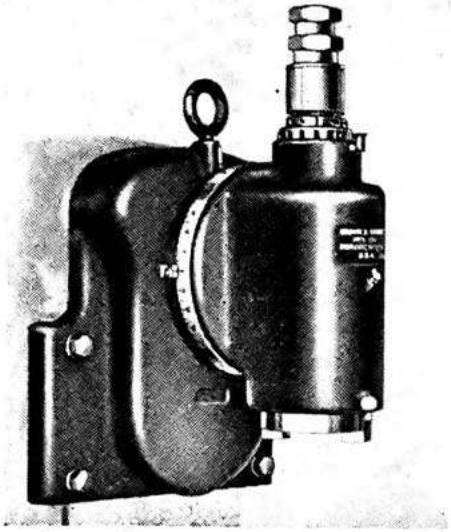
The spindle of these attachments has a taper hole and can be set at any angle from a vertical to a horizontal position. Position is indicated by graduations reading to half degrees.

No. of Att.	Machine where used	No. of B&S Taper Hole in Spindle	Center of Spindle to Face of Column		Center of Mach. Spdl. to End of Att. Spdl., Inches	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
			Greatest, Inches	Least, Inches				
0	Nos. 0, 0Y Plain	7	12	3¼	2 11/16	R	50	63
	No. 0 Omniversal No. 2 Universal (Light Type) No. 2 Plain (Light Type)	7	16 5/16	10⅛	2 11/16	R	68	83
1	Nos. 1A Std., 2A Std., 2A High Speed Universal Nos. 1B Std., 1Y (Begins No. 1963), 2B Std., 2B High Speed, 2Y (Begins No. 3774), 2YB Std. 22 Plain No. 21 Automatic (Begins No. 143)	7	14¼	5	2 11/16	R	92	118
2	Nos. 3A Std., 3A High Speed Univ. Nos. 3B Std., 3B High Speed Plain	7	19	4⅛	4⅞	R	104	134

R Collet has Nos. 7 and 5 Tapers. Attachments suitable for speeds to 3300 R. P. M.
Ratio of Attachment Spindle to Machine Spindle, 2½ to 1.
Draw-in bolt is furnished. Threaded, ⅜" diameter—16 L.H.
In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

Nos. 3 and 1H Vertical Milling Attachments

When ordering, give size and serial number of machine.



The Vertical Milling Attachments are particularly advantageous on work where it is better to hold the piece in a horizontal position so that the operator may watch the cut more closely. End milling, face milling, boring, drilling and cutting T-slots or spirals are types of operations that are efficiently performed on horizontal spindle milling machines fitted with these attachments.

The spindle has a standardized end with the arbors and adapters held in place by a draw-in bolt. Face mills are bolted direct to the spindle end.

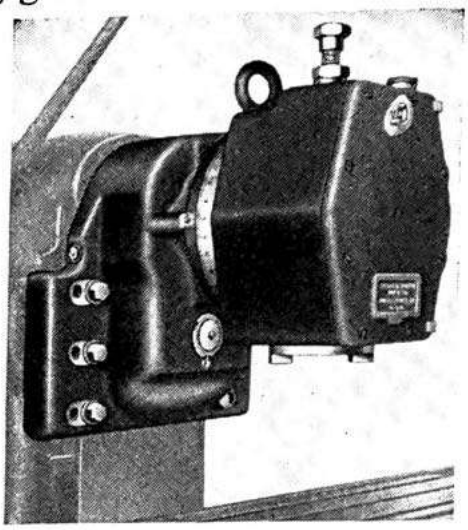
The spindles of these attachments can be set at any angle from a vertical to a horizontal position. Position is indicated by graduations reading to half degrees.

No. of Att.	Machine where used	No. of Milling Mach. Std. Taper Hole in Spindle	Center of Spindle to Face of Column, Inches	Center of Mach. Spdl. to End of Att. Spdl., Inches	Net Wt., Lbs.	Shipping Wt., Lbs.
3	No. 4A Std. Univ. No. 4B Std. Plain Nos. 1A Std., 2A Std. Universal	50	11 1/16	1 13/16	265	310
1H	Nos. 1B Std., 1Y (Begins No. 1963), 2B Std., 2Y (Begins No. 3774), 2YB Std. Plain No. 21 Automatic (Begins No. 143)	50	10 7/8	1 13/16	215	258

Ratio of Attachment Spindle to Machine Spindle, 1 to 1.
Attachments suitable for speeds to 800 R. P. M.
Draw-in bolt is furnished. Threaded, 1" diameter—8 R.H. and 5/8" diameter—11 R.H.
In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

No. 12H Vertical Milling Attachment

When ordering, give size and serial number of machine.



The No. 12H Vertical Milling Attachment is designed for heavier work requiring high spindle speeds. The spindle is driven by hardened steel bevel and spur gears and the drive is by anti-friction bearings throughout. The spindle can be set at any angle from a vertical to a horizontal position. The position is indicated by graduations reading to half degrees.

A reservoir oiling system assures adequate lubrication for all positions of the swivel head.

The spindle has a standardized end with arbors and adapters held in place by a draw-in bolt. Face mills are bolted direct to the spindle end.

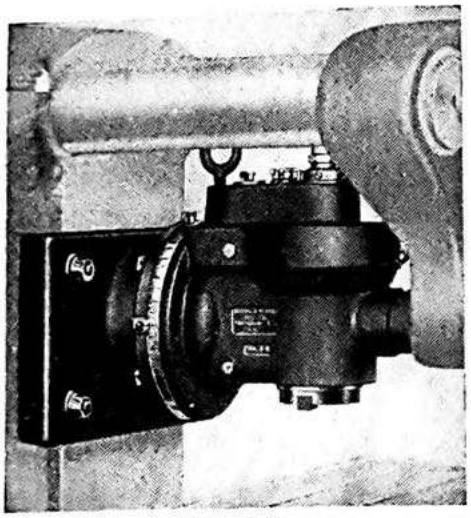
No. of Att.	Machine where used	No. of Milling Mach. Std. Taper Hole in Spindle	Center Spdl. to Face of Column, In.	Center Mach. Spdl. to End of Att. Spdl., In.	Net Wt., Lbs.	Shipping Wt., Lbs.
12H	No. 1A Std. Universal No. 1B Std. Plain No. 2A Std. Universal No. 2A High Speed Universal No. 2B Std. Plain No. 2B High Speed Plain No. 2YB Std. Plain No. 3A Std. Universal No. 3A High Speed Universal No. 3B Std. Plain No. 3B High Speed Plain	50	12	1¼	296	350

Ratio of Attachment Spindle to Machine Spindle, 1 to 1. Attachment suitable for speeds to 1300 R. P. M.

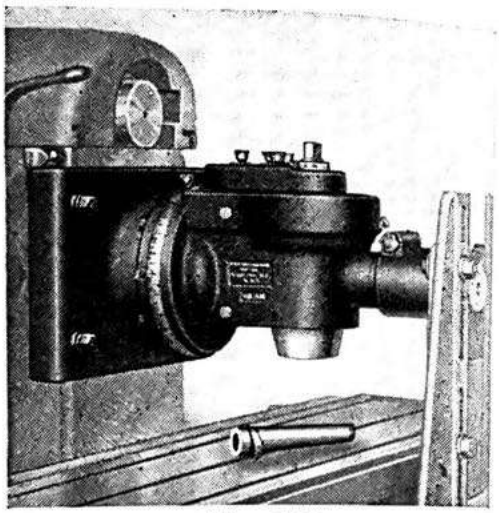
Draw-in bolt is furnished. Threaded, 1″ diameter—8 R. H. and ⅝″ diameter—11 R.H.

Nos. 3H and 4H
Vertical Milling Attachments

When ordering, give size and serial number of machine.



No. 3H



No. 4H

These attachments are designed for the heaviest class of milling within the capacity of the machines for which they are adapted. They are securely clamped to the machine by being bolted to the column. In addition, the outer end of the No. 3H is supported by the arbor yoke, while on the No. 4H the outer end of the attachment is supported by the arm braces.

The spindle of the No. 3H has a standardized end with the arbors and adapters held in place by a draw-in bolt and face mills bolted direct to the spindle end, while that of the No. 4H has a taper nose. The spindles run in bronze boxes provided with means of compensation for wear and are driven by hardened steel bevel and spur gears. The attachments can be set at any angle from a vertical to a horizontal position with position indicated by graduations reading to half degrees.

No. of Att.	Machine where used	No. of Milling Mach. Std. or B. & S. Taper Hole in Spindle	Center Spdl. to Face of Column, In.	Center Mach. Spdl. to End of Att. Spdl., In.	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
3H	No. 4A Std. Universal	50	14	4⅞	TU	260	350
	No. 4B Std. Plain					415	550
4H	No. 4B Heavy Plain (Begins No. 901)	14	14	5 11/16			

TU Collet has Nos. 14 and 9 Tapers.

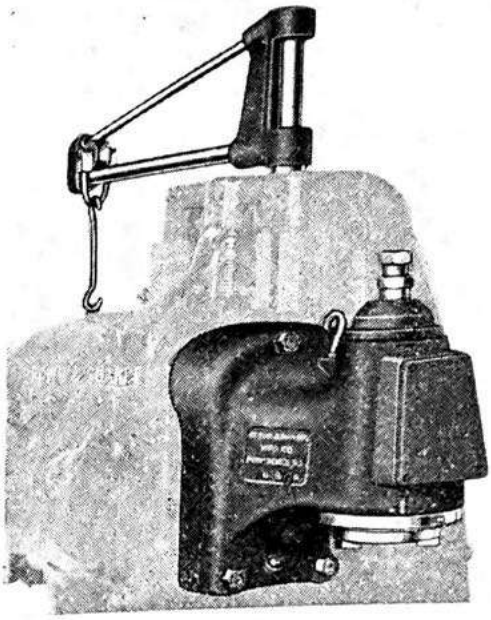
Ratio of Attachment Spindle to Machine Spindle, 1 to 1. Attachments suitable for speeds to 500 R. P. M.

Draw-in bolt is furnished. Threaded, 1″ diameter—8 R.H. on No. 3H; 1″ diameter—10 L.H. on No. 4H.

In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

No. 22 Vertical Milling Attachment

(Shown with No. 22 Attachment Crane*)



The No. 22 Vertical Milling Attachment is entirely self-contained—no loose parts to be lost—the attaching bolts, while free to turn in the base of the attachment, cannot be completely removed. When the attachment is not being used, it is stored at the rear of the machine on a finished pad.

When the use of the attachment is desired, the top attaching bolt which holds the head in place on the storage pad, is loosened and the head swung around to the spindle end of the machine. The No. 22 Attachment Crane* mounted on the top of the upright carries the weight of the head, relieving the operator of all lifting effort.

The attachment spindle is mounted on anti-friction bearings and is driven from the machine spindle through spur and bevel gears.

No. of Att.	Machine where used	No. of Milling Mach. Std. Taper Hole in Spindle	Center Att. Spdl. to Face of Spdl. Hd., In.	Center Mach. Spdl. to End of Att. Spdl., In.	Net Wt., Lbs.	Shipping Wt., Lbs.
22	No. 22 Plain	50	12⅛	1	160	190

*No. 22 Attachment Crane is not included unless ordered as an extra.
Ratio of Attachment Spindle to Machine Spindle, 1½ to 1. Attachment suitable for speeds to 1500 R. P. M.
Draw-in bolt is furnished. Threaded, 1″ diameter—8 R.H. and ⅝″ diameter—11 R.H.

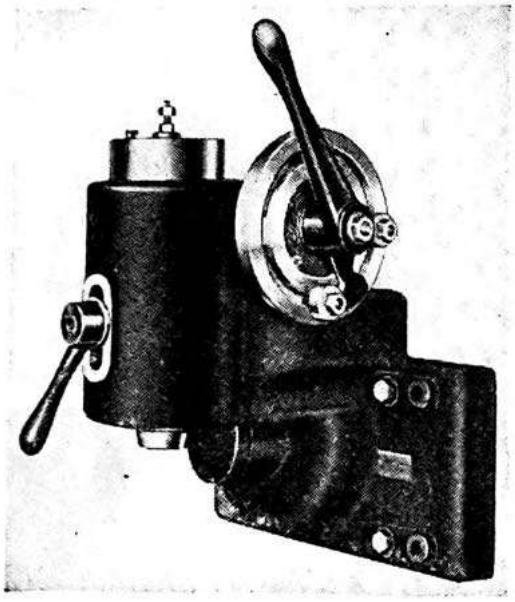
No. 22 Attachment Crane

All No. 22 Plain Milling Machines have a finished pad cast on the rear side of the upright, and the No. 22 Attachment Crane described above, for easily handling the No. 22 Vertical Milling Attachment, can be readily applied at any time.

Weights. Net, 30 lbs. Shipping, 55 lbs.

No. 10 High Speed Vertical Milling Attachment

When ordering, give size and serial number of machine.



This attachment is designed particularly for manufacturing jobs where it is desirable to raise the spindle to clear the cutter from the work to facilitate loading or for milling keyways, slots, and other similar work where it is desired to feed the cutter into the work by hand before engaging the power feed of the table.

The spindle of the attachment is always in a vertical plane. It runs in anti-friction bearings and is adequately protected. Adjustable stops are provided to regulate the movement of the spindle when milling duplicate pieces. The spindle can also be clamped in any desired position.

No. of Att.	Machine where used	No. of B. & S. Taper Hole in Spindle	Hand Vertical Feed, Inches	Center of Spdl. to Face of Column, Inches	Center of Mach.Spdl. above end of Att. Spdl., Max., Ins.	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
10	No. 1A Std. Univ. No. 1B Std. Plain No. 1Y Pl. (Begins No. 1963) No. 2A Std. Univ. No. 2A High Speed Univ. No. 2B Std. Plain No. 2B High Speed Plain No. 2Y Pl. (Begins No. 3774) No. 2YB Std. Plain No. 3A Std. Univ. No. 3A High Speed Univ. No. 3B Std. Plain No. 3B High Speed Plain No. 21 Automatic (Begins No. 143)	9	2⅜	9½	1 11/16	K	245	290

K Collet has Nos. 9 and 5 Tapers.

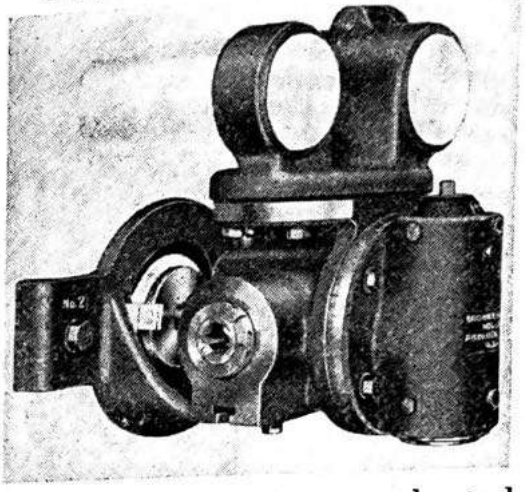
Ratio of Attachment Spindle to Machine Spindle, 5½ to 1. Attachment suitable for speeds to 3000 R. P. M.

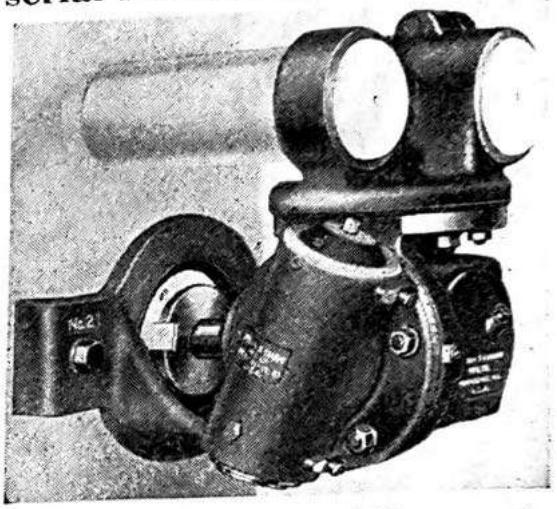
Draw-in bolt is furnished. Threaded, 7/16" diameter—14 L.H.

In most instances we are prepared to furnish attachments for older types of machines. Prices and delivery upon application.

Nos. 1 and 2 Compound Vertical Milling Attachments

When ordering, give size and serial number of machine.





These attachments are adapted to a large variety of milling as they permit the spindle to be set in two planes. They are especially advantageous when it is desired to set the spindle in a plane at right angles to the table for milling angular strips, tableways, etc. With the spindle in this position the full length of the table travel is available and an end mill, instead of an angular cutter, can be used for milling the angle.

The spindle is mounted on two anti-friction bearings. It is driven by bevel gears and can be set at any angle from a vertical to a horizontal position. Position is indicated by graduations reading to half degrees.

No. of Att.	Machine where used	No. of B. & S. Taper Hole in Spindle	Center of Spindle to Face of Column		Center Mach. Spindle to End of Att. Spindle, In.	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
			Max., In.	Min., In.				
1	No. 1A Std. Universal No. 1B Std. Plain No. 1Y Plain (Begins No. 1963) No. 2A Std. Universal No. 2A High Speed Universal No. 2B Std. Plain No. 2B High Speed Plain No. 2Y Plain (Begins No. 3774) No. 2YB Std. Plain	9	14 5/16	11 3/8	5 7/8	K	145	175
2	No. 3A Std. Universal No. 3A High Speed Universal No. 3B Std. Plain No. 3B High Speed Plain	9	14 1/8	11 3/16	5 7/8	K	146	190

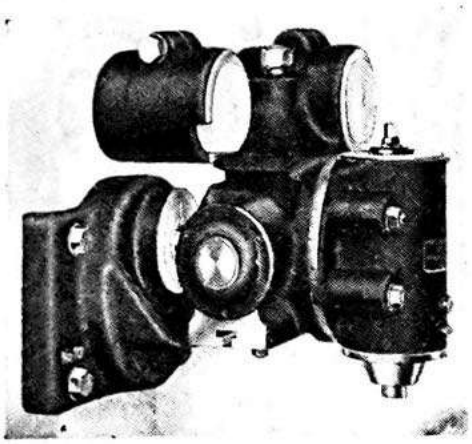
K Collet has Nos. 9 and 5 Tapers.

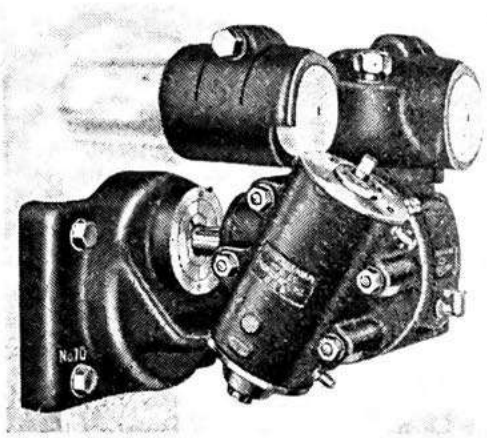
Ratio of Attachment Spindle to Machine Spindle, 1½ to 1. Attachment suitable for speeds to 1300 R. P. M. Draw-in bolt is furnished. Threaded, 7/16″ diameter—14 L.H.

In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

No. 10 High Speed Compound Vertical Milling Attachment

When ordering, give size and serial number of machine.





This attachment is similar in design to the Nos. 1 and 2 Compound Vertical Milling Attachments but is provided with a much higher spindle speed. It is adaptable to a large variety of milling and is especially advantageous when it is desired to set the spindle at right angles to the table. The high spindle speed particularly adapts it for die work where high spindle speeds are essential. The spindle and spindle driving gears are carried on anti-friction bearings.

Two horizontal positions of the attachment spindle are available through a swivel which allows the spindle to be set at an angle of 90° and still be driven directly from the machine spindle. Adjustments in the vertical plane are also provided with the amount indicated by a scale on the periphery of the swivel graduated to half degrees. Clamp bolts hold the spindle in position for both adjustments.

No. of Att.	Machine where used	No. of B. & S. Taper Hole in Spindle	Center of Spindle to Face of Column		Center Mach. Spindle to End of Att. Spindle, In.	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
			Max., In.	Min., In.				
10	No. 1A Std. Universal No. 1B Std. Plain No. 2A Std. Universal No. 2A High Speed Universal No. 2B Std. Plain No. 2B High Speed Plain No. 2YB Std. Plain	9	17¼	12¼	3 7/16	K	180	220

K Collet has Nos. 9 and 5 Tapers.

Ratio of Attachment Spindle to Machine Spindle, 3½ to 1. Attachment suitable for speeds to 2700 R. P. M.

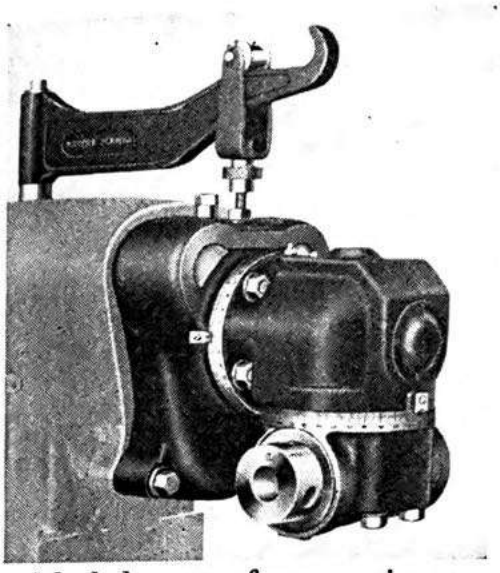
Draw-in bolt is furnished. Threaded, 7/16" diameter—14 L.H.

In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

No. 0 Universal Milling Attachment

(Shown with No. 0 Attachment Crane*)

When ordering, give size and serial number of machine.



On this Universal Milling Attachment, rigid support is given by the secure clamping to both overarms in addition to the column face. The spindle has the new Brown & Sharpe Cam Lock construction for holding cutters, etc., that gives ease of insertion and removal with the assurance of a positive drive. It is driven by heat treated alloy steel spur and bevel gearing mounted on splined shafts. Spindle and driving shafts are supported on anti-friction bearings. The attachment is adjustable to any angle in a horizontal or vertical plane with position indicated by graduations reading to half degrees.

In addition to the general usefulness of the Universal Milling Attachment, an added degree of convenience and operating efficiency has been provided when used in conjunction with the *No. 0 Attachment Crane. The No. 0 Universal Milling Attachment can be swung into position readily with a minimum of time and effort from its position on the side of the machine where it remains when not in use.

No. of Att.	Machine where used	No. of Milling Machine Std. Taper Hole in Spindle	Center of Spindle to Face of Column, Inches	Center of Mach. Spdl. to End of Att. Spdl. in Vert. Pos., Inches	Net Wt., Lbs.	Shipping Wt., Lbs.
0*	No. 2 Universal (Light Type) No. 2 Plain (Light Type)	30	11	4¼	88	105

Ratio of Attachment Spindle to Machine Spindle, 2 to 1. Attachment suitable for speeds to 2700 R. P. M.

*No, 0 Attachment Crane is not included unless ordered as an extra.

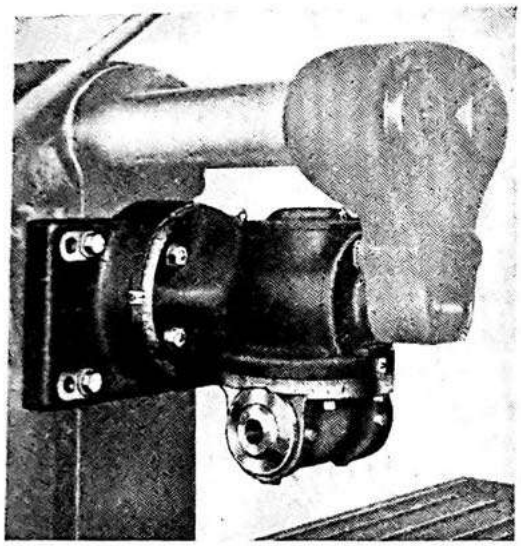
No. 0 Attachment Crane

Designed for convenient handling of the No. 0 Universal Milling Attachment or No. 0 Slotting Attachment. Consists of a *supporting stud, steel arm, traveller and adjusting nut as shown. The construction permits the traveller to be unhooked readily if desired to remove attachment from machine. Net weight, 9 lbs. Shipping weight, 14 lbs.

*Top of machine column is drilled for attaching supporting stud.

Nos. 12 and 3
Universal Milling Attachments

When ordering, give size and serial number of machine.



The No. 12 Universal Milling Attachment is designed with anti-friction bearings throughout to enable it to be run at the high speeds of the High Speed Milling Machines.

The spindle is driven by hardened bevel gears and has a taper hole. The attachment can be set at any angle in both vertical and horizontal planes with the position indicated by graduations reading to half degrees.

The No. 3 Universal Milling Attachment spindle is mounted on two anti-friction bearings. It is driven by bevel gears and has a taper hole. Attachment can be set at any angle in both vertical and horizontal planes with the position indicated by graduations reading to half degrees.

Both attachments are clamped securely to the face of column and supported at the outer end by the arbor yoke.

No. of Att.	Machine where used	No. of B & S. Taper Hole in Spindle	Center of Spdl. to Face of Column, Inches	Center of Mach. Spdl. to End of Att. Spdl. in Vert. Pos., Inches	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
12	No. 1A Std. Universal No. 1B Std. Plain No. 1Y Plain (Begins No. 1972) No. 2A Std. Universal No. 2A High Speed Universal No. 2B Std. Plain No. 2B High Speed Plain No. 2Y Plain (Begins No. 3772) No. 2YB Std. Plain No. 21 Automatic (Begins No. 143)	9	10⅝	3⅞	RR	155	195
3	No. 3A Std. Universal No. 3A High Speed Universal No. 3B Std. Plain No. 3B High Speed Plain No. 4A Std. Universal No. 4B Std. Plain	9	10 13/16	3⅞	K	178	217

RR Collet has Nos. 9 and 7 Tapers. K Collet has Nos. 9 and 5 Tapers.

Ratio of Attachment Spindle to Machine Spindle, 1½ to 1.

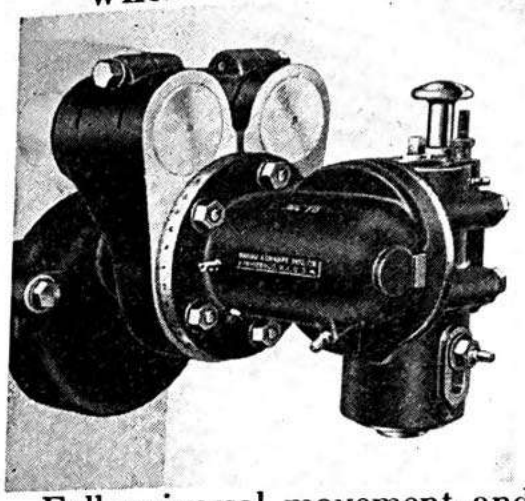
Attachment suitable for speeds to 2000 R. P. M. on the No. 12; 800 R. P. M. on the No. 3.

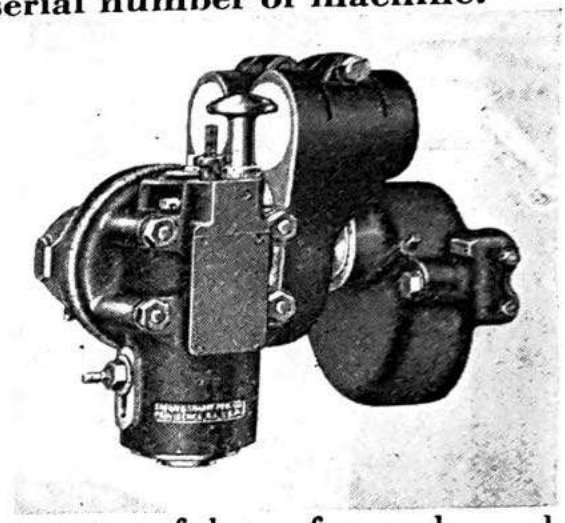
Draw-in bolt furnished. Threaded, 7/16" diameter—14 L.H.

In most instances we are prepared to furnish attachments for older types of machines. Prices and delivery upon application.

No. 10 High Speed Universal Milling Attachment

When ordering, give size and serial number of machine.





Full universal movement and consequent usefulness for such work as drilling, milling angular slots and surfaces, cutting racks, milling dies, moulds and other intricate tool work are the advantages of this high speed attachment.

The spindle and spindle driving gears are mounted on anti-friction bearings. Scales, graduated to half degrees, indicate the settings in both horizontal and vertical planes.

In addition to the high speed feature, this attachment is provided with a hand feed adjustment which adapts it to angular boring or setting end mills into the work.

No. of Att.	Machine where used	No. of B.&S. Taper Hole in Spdl.	Center of Spindle to Face of Column		Center Mach. Spdl. to End of Att. Spdl., Max., In.	Independ. Endwise Adj. of Att. Spdl., In.	Collet Furnished	Net Wt., Lbs.	Shipping Wt., Lbs.
			Max., In.	Min., In.					
10	No. 1A Std. Universal No. 1B Std. Plain No. 2A Std. Universal No. 2A High Spd. Universal No. 2B Std. Plain No. 2B High Spd. Plain No. 2YB Std. Plain	9	15¼	9¼	6¼	1½	RR	187	239

RR Collet has Nos. 9 and 7 Tapers.

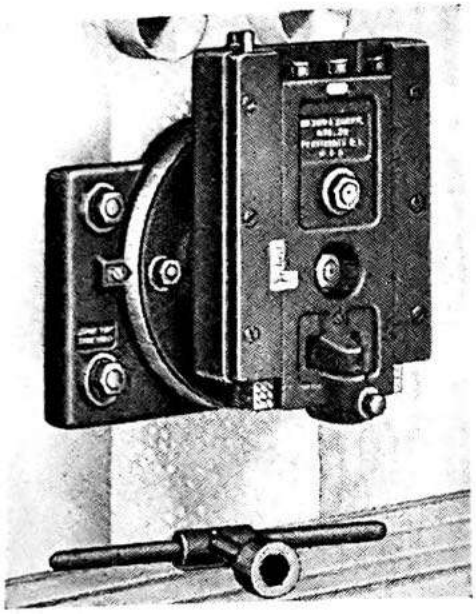
Ratio of Attachment Spindle to Machine Spindle, 3½ to 1. Attachment suitable for speeds to 2400 R. P. M.

Draw-in bolt is furnished. Threaded, 7/16″ diameter—14 L.H.

In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

Nos. 0, 1, 2, 3 and 4 Slotting Attachments

When ordering, give size and serial number of machine.



The tool slide of the attachment is driven from the main spindle of the machine by an adjustable crank that allows the stroke to be set at various lengths. The slide can be set at any angle between 0 and 90° either side of the center line, the position being indicated by a graduated scale on the periphery of the swivel reading to ½ degrees. A scale on the front of the tool slide serves to set the length of stroke.

The tools are held in place by clamp bolts. A tool stop that swings over the top of the tool shank makes it impossible for the tool to be pushed through.

The No. 0 Slotting Attachment for use on No. 0 Omniversal and Light Type Milling Machines is designed to be used with the No. 0 Attachment Crane (shown on Page 69) which adds greatly to convenience in handling.

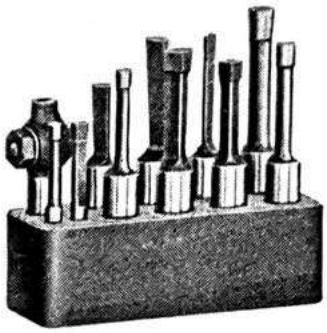
No. of Att.	Machine where used	Dia. of Hole for Tool Shank, In.	Adjust. of Stroke, In.	Face of Column to Center of Tool Holder, In.	Net Wt., Lbs.	Shipping Wt., Lbs.
0	No. 0 Plain (Begins No. 895) No. 0Y Plain (Begins No. 930) No. 0 Omniversal No. 2 Univ. (Light Type) No. 2 Plain (Light Type)	½	0 to 2	*6 ⅞	100	135
1	No. 1A Standard Universal No. 2A Standard Universal No. 2A High Speed Univ. No. 1Y Plain (Begins No. 1963) No. 1B Standard Plain No. 2Y Plain (Begins No. 3774) No. 2B Standard Plain No. 2B High Speed Plain	½	0 to 2	8 ⅛	125	145
2	No. 3A Standard Universal No. 3A High Speed Univ. No. 3B Standard Plain No. 3B High Speed Plain	⅝	0 to 3	8 ¾	160	190
3	No. 4A Standard Universal No. 4B Standard Plain	⅝	0 to 3	8 15/16	208	243
4	No. 4B Heavy Plain	¾	0 to 4	9 ¾	292	326

*11⅝" on No. 0 Omniversal, No. 2 Universal (Light Type) and No. 2 Plain (Light Type).

In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

Sets of Tools

For Slotting Attachments



These tools are selected as those that most fully meet the requirements of the class of work on which the Slotting Attachments are usually employed. Each set is conveniently arranged in a hard wood block. Tools are not furnished with Slotting Attachments unless ordered.

For Nos. 0 and 1 Attachments

3 Square Pointed Tools, 3/16", 1/4", 5/16"; Nos. 3, 4, 6.
4 Round Pointed Tools, 3/16", 1/4", 5/16", 3/8"; Nos. 11, 12, 14, 16.
1 Parting Tool, 1/8" wide; No. 20.
2 Angle Tools, 75°, 3/8", 5/16"; Nos. 22, 24.
1 Collet, No. 1.
1 Block, No. 30.
Net weight, 1 3/4 lbs.
Shipping weight, 2 3/4 lbs.

For Nos. 2 and 3 Attachments

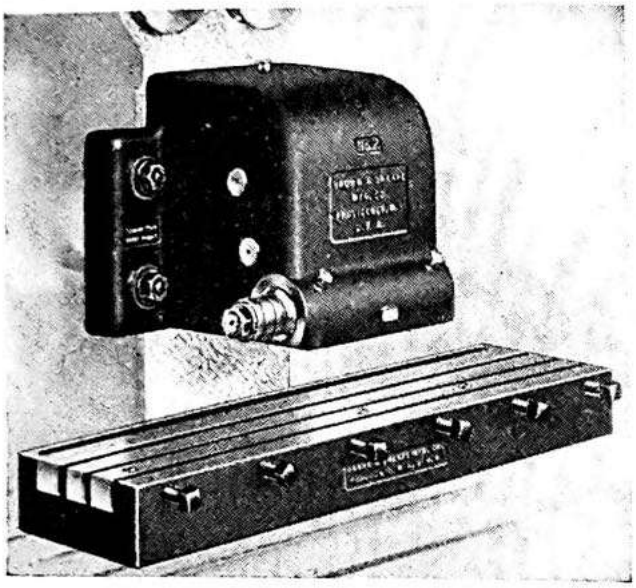
3 Square Pointed Tools, 1/4", 5/16", 3/8"; Nos. 33, 34, 36.
4 Round Pointed Tools, 1/4", 5/16", 3/8", 1/2"; Nos. 41, 42, 44, 46.
1 Parting Tool, 1/8" wide, No. 50.
2 Angle Tools, 75°, 7/16", 3/8"; Nos. 52, 54.
1 Collet, No. 31.
1 Block, No. 60.
Net weight, 3 lbs.
Shipping weight, 4 1/4 lbs.

For No. 4 Attachment

3 Square Pointed Tools, 1/4", 3/8", 1/2"; Nos. 63, 64, 66.
4 Round Pointed Tools, 1/4", 3/8", 1/2", 5/8"; Nos. 71, 72, 74, 76.
1 Parting Tool, 1/8" wide, No. 80.
2 Angle Tools, 75°, 1/2", 5/8"; Nos. 82, 84.
1 Collet, No. 61.
1 Block, No. 90.
Net weight, 4 1/2 lbs.
Shipping weight, 5 1/2 lbs.

Nos. 1, 2 and 3
Rack Milling Attachments

When ordering, give size and serial number of machine.



The Rack Milling Attachment, while designed primarily for cutting the teeth in racks, can also be used in connection with the Universal Spiral Index Centers for cutting worms and many other miscellaneous operations.

The cutter is mounted on the end of a spindle that extends through the attachment case parallel to the table T-slots. The spindle is hardened and ground, and runs in bronze boxes. It is smoothly and powerfully driven from main spindle of machine through hardened steel bevel and spur gears.

Nos. 1, 2 and 3 Attachments take same cutters as listed for our Nos. 3, 4 and 5 Automatic Gear Cutting Machines respectively.

The vise furnished with Nos. 1 and 2 Attachments has jaws 26″ long which will open to 3″. The vise furnished with No. 3 Attachment has jaws 36″ long which will open to 4″.

These attachments are suitable only for machines with automatic transverse feed.

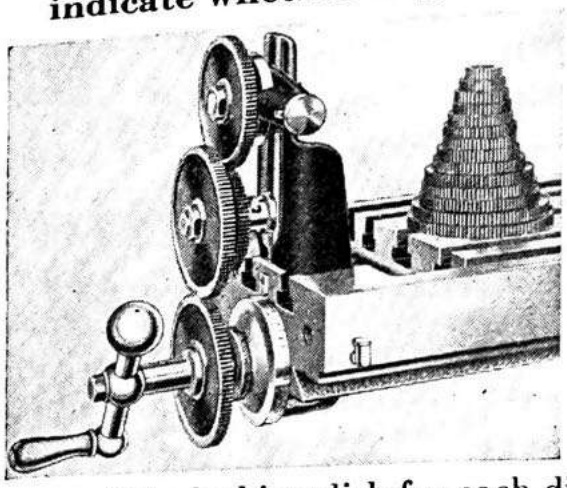
No. of Att.	Machine where used	Dia. of Cutter Spdl., In.	Center of Spdl. to Bottom of Spdl. Head, In.	Center of Spdl. to Face of Column, In.	Capacity, Diametral Pitch		Net Wt., Lbs.	Shipping Wt., Lbs.
					Steel	Cast Iron		
1	No. 1A Std. Universal No. 2A Std. Universal No. 2A High Speed Univ. No. 1B Std. Plain No. 2B Std. Plain No. 2B High Speed Plain	1	1 1/32	8	6	5	180	225
2	No. 3A Std. Universal No. 3A High Speed Univ. No. 3B Std. Plain No. 3B High Speed Plain	1 1/4	1 7/32	9 1/16	5	4	230	300
3	No. 4A Std. Universal No. 4B Std. Plain	1 1/2	1 3/8	9 11/32	4	3	395	495

In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

Nos. 1S, 2S and 3S
Rack Indexing Attachments

For Use with Rack Milling Attachments

When ordering, give size and serial number of machine and indicate whether English or Metric Attachment is desired.



The Indexing Attachment consists of a bracket that is fastened to the table T-slot at the left-hand end. The bracket carries the locking disk, together with the change gears for gearing to the feed screw. When cutting racks, a convenient means of quickly indexing and accurately spacing the teeth is furnished by this Indexing Attachment. To index any required spacing, change gears are selected that will produce one or more whole turns of the locking disk for each division the locking pin is withdrawn. The table is then advanced by the crank on the feed screw until the pin drops into the slot again and locks the disk. This method of indexing is much more satisfactory than relying upon a dial such as is ordinarily used for the purpose.

Change gears are furnished for cutting teeth as follows:

ENGLISH. Diametral pitch; 3 to 6 by half pitches, all pitches from 7 to 16, even pitches 18 to 32 inclusive. Circular pitch, 1/16″ to 1″ by sixteenths; also 22 odd intervening pitches.

METRIC. Module; 1 to 3 by 1/4 modules, 3 1/2 to 8 by 1/2 modules. Circular pitch, all pitches from 2 mm to 16 mm inclusive.

Index Table is furnished for use in connection with attachment.

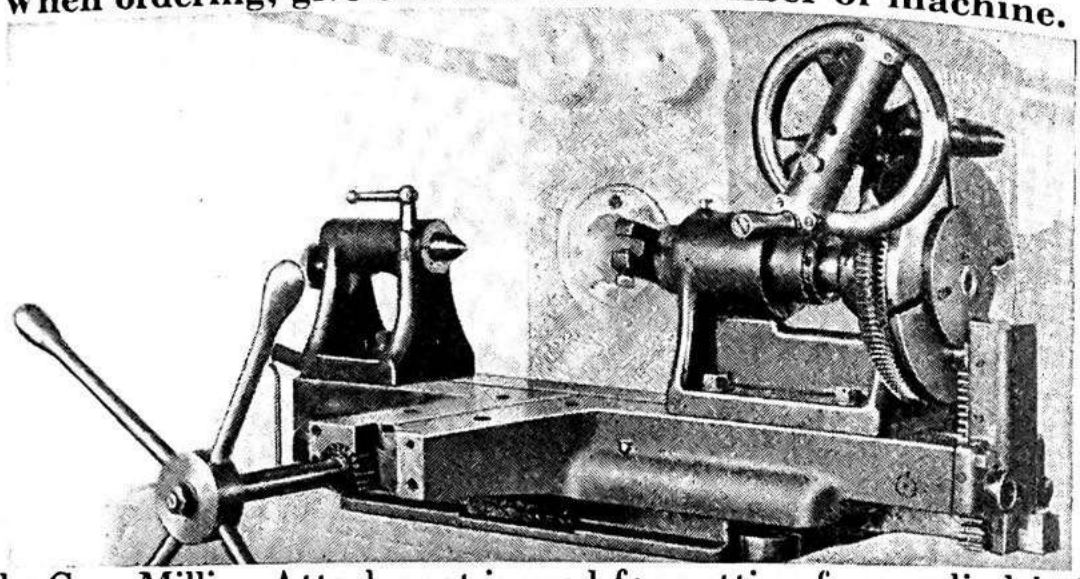
No. of Att.	Machine where used	Net Weight, Lbs.	Shipping Weight, Lbs.
1S	No. 1A Standard Universal No. 2A Standard Universal No. 2A High Speed Universal No. 1B Standard Plain No. 2B Standard Plain No. 2B High Speed Plain	18	45
2S	No. 3A Standard Universal No. 3A High Speed Universal No. 3B Standard Plain No. 3B High Speed Plain	20	47
3S	No. 4A Standard Universal No. 4B Standard Plain	20	47

This attachment, with a few additional gears, can also be used to cut Metric racks when table is equipped with an English screw.

In most instances, we are prepared to furnish attachments for older types of machines. Prices and delivery upon application.

No. 10 Cam Milling Attachment

When ordering, give size and serial number of machine.



The Cam Milling Attachment is used for cutting face, cylindrical or peripheral cams from a flat former. The necessary longitudinal and rotative movements are contained in the attachment, allowing the table of the machine to remain clamped in one position during the cutting of the cam.

The former is made from a flat disk about ½″ thick and can be easily machined to the form required. It is secured to the face of the worm-wheel on the spindle which carries the blank to be cut.

Cams to 12″ in diameter with any throw to 5″ can be mounted.

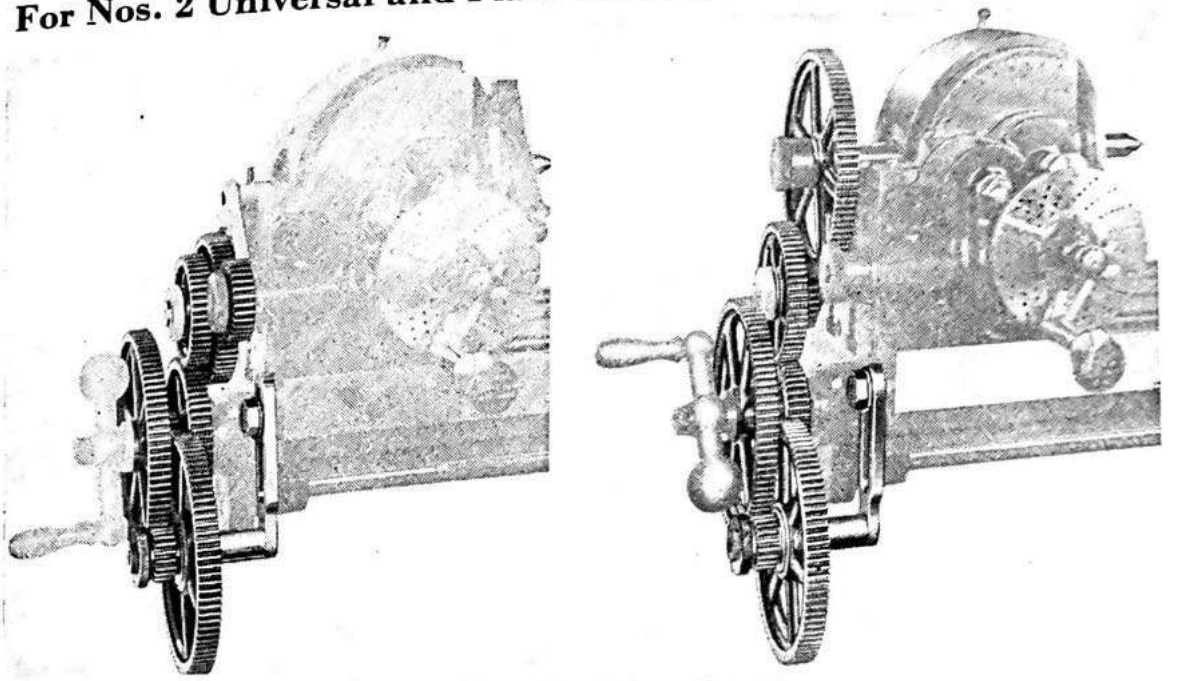
Distance between centers, max., 10½″.

Machine where used	Net Wt., Lbs.	Shipping Wt., Lbs.
No. 0 Omniversal No. 1A Std. Universal No. 2 Universal (Light Type) No. 2A Std. Universal No. 2A High Speed Universal No. 1Y Plain No. 1B Std. Plain No. 2 Plain (Light Type) No. 2Y Plain No. 2B Std. Plain No. 2B High Speed Plain No. 2YB Std. Plain No. 3A Std. Universal No. 3A High Speed Universal No. 3B Std. Plain No. 3B High Speed Plain	490	650

Power Feed. The attachment can be furnished with power feed at extra cost. A three-step cone pulley, taking a round belt, is mounted on the end of the worm shaft and driven from a small jackshaft which is belted from the main countershaft. The pulley is clutched to the worm, so that either hand or power feed can be employed by the simple movement of a lever.

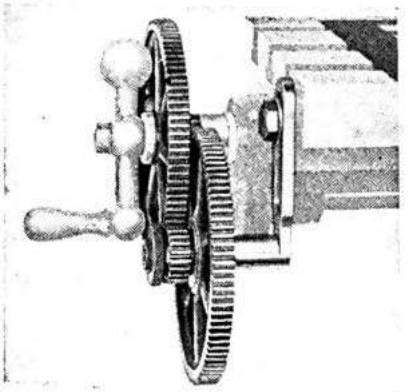
The power feed can be attached to all Cam Milling Attachments of previous design made by us, with only slight changes in the attachment.

No. 0
Short Lead and Feed Reducing Attachment
For Nos. 2 Universal and Plain Milling Machines (Light Type)



Used as Short Lead Attachment

This attachment consists of nine gears with brackets and clutch which supplement the regular change gears furnished with the Universal Spiral Index Centers, and provide a convenient means of obtaining very short leads. In addition it permits obtaining fine longitudinal feeds, 1/20 of the normal feeds. Leads 1/20 of normal can be obtained when geared to the worm of the headstock, while leads 1/800 of normal are possible when geared direct to spindle, as shown above. A handy clutch is provided for disengagement of drive through gear train when making hand adjustments or for quick return to starting position.



Used as Feed Reducing Attachment

This attachment may be used without the Universal Spiral Index Centers, as shown, as a means of reducing longitudinal feeds to 1/20 of the indicated rate for work requiring extremely fine feeds, such as milling with a fly cutter. Only four gears are required in the train between table screw and table feed shaft.

Net weight, 16 lbs. Shipping weight, 20 lbs.

When used on the No. 2 Plain (Light Type) as a Short Lead Attachment, Universal Spiral Index Centers are necessary in addition.

No. 2VS High Speed Milling Attachment

The attachment equips the No. 2 Standard Vertical Spindle Milling Machine exceptionally well for the heavier class of die sinking and other work where a high speed is required.

The spindle runs in a phosphor bronze bearing. It is driven from main spindle of machine by a spur gear meshing with a pinion integral with the attachment spindle.

Machine where used	No. 2 Standard Vertical
Taper hole in spindle ..... No.	9
Speeds in geometrical progression ..... r.p.m.	53 to 1256
Weights Net ..... lbs.	42
Weights Shipping ..... lbs.	55
D collet and knock-out rod furnished.	

Nos. 1 and 2 Tilting Tables

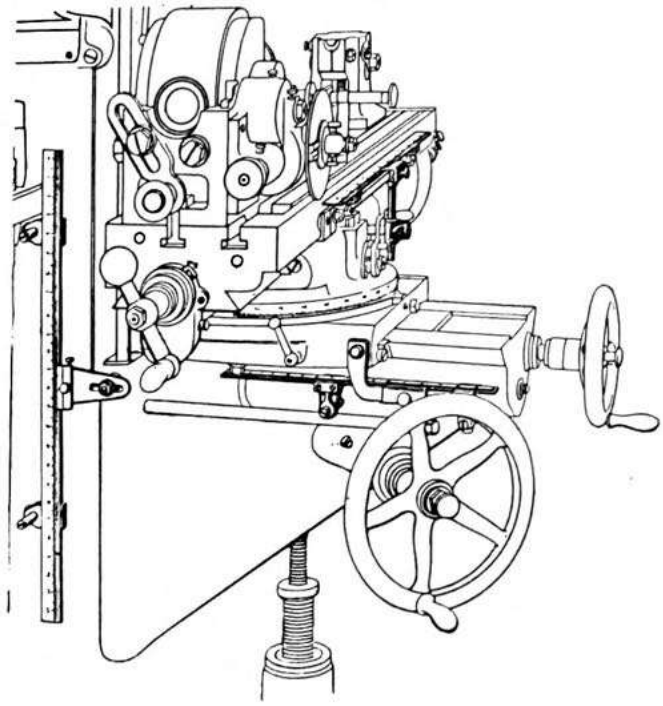
For Taper Milling

The Tilting Table is designed for use in the milling of flutes in taper reamers, taps, etc. Any ordinary index centers may be used with it. The No. 1 Table is especially adapted for use with our No. 2½ Triple Index Centers and the No. 2 for Nos. 4 and 14 Triple Index Centers.

No. of table	1	2
Working surface of table ..... inches	28½ x 6	42¼ x 9¼
Width of slot in table of attachment .... inches	⅝	11/16
Width of tongue to fit machine table .... inches	11/16 and 13/16	11/16 and 13/16
Greatest taper per foot of diameter table will mill ..... inches	1¼	1½
Height of table when level ..... inches	2 9/16	3¼
Weights Net ..... lbs.	100	270
Weights Shipping ..... lbs.	116	295

Scales and Verniers

When ordering, give size and serial number of machine.



These Scales and Verniers, reading to thousandths of an inch, are used for obtaining very fine longitudinal, transverse and vertical adjustments of the table of milling machines. The Longitudinal Scale is attached to the front of the table of the machine; the Transverse Scale to the side of the knee; and the Vertical Scale to the side of the column.

The Longitudinal and Vertical Scales are 24″ long, and the Transverse 14″ long.

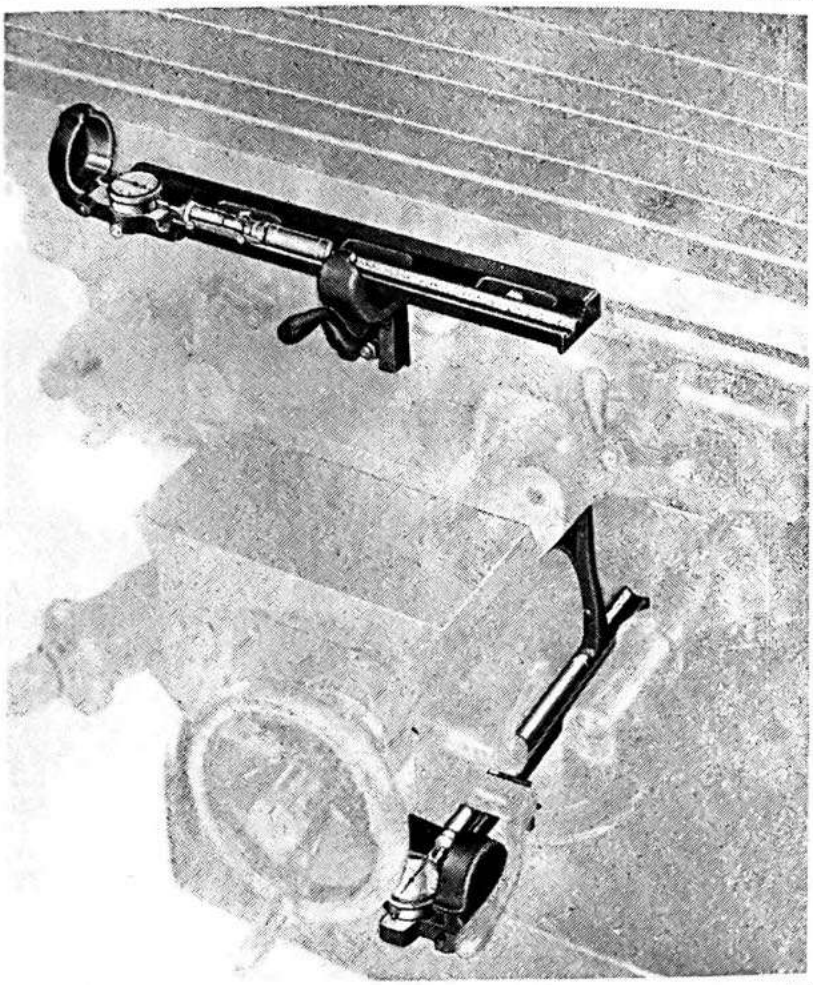
This equipment is available for use on the Standard type machines, and, in most instances, for the older types of machines.

It is recommended that the Scales and Verniers be attached to the machine before shipment from the factory.

Metric Scales and Verniers reading to 1/50 m/m, furnished when desired.

Nos. 1, 2, 3 and 4
Micrometer Table Setting Attachments

When ordering, give size and serial number of machine.



The Micrometer Table Setting Attachment (English or Metric) consists of two units, one for the transverse and the other for the longitudinal adjustment of the table. They are located on the side of the knee and on the front of the table respectively. Brackets and V supports hold a measuring bar and a micrometer head which are placed between the anvils and the dial gages attached to the table and knee. A set of twelve measuring bars, varying from one to twelve inches, is furnished with the attachment. These bars can be used in combination to obtain various adjustments. The micrometer head is furnished for fine adjustments.

In the manufacture of jigs and in die work, within the range stated, the Micrometer Table Setting Attachment enables the operator to perform boring and recessing operations with great ease.

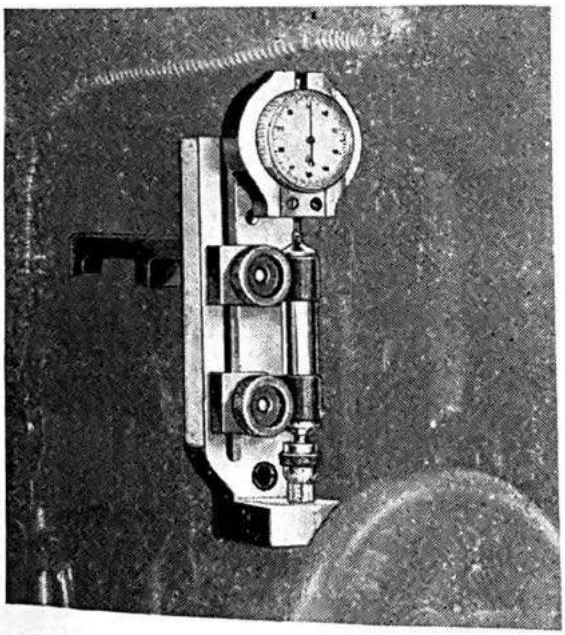
Micrometer Table Setting Attachments (*Continued*)

No. of Att.	Machine where used	Range: Long. Adj., Max., In.	Range: Trans. Adj., Max., In.	Net Weight, Lbs.	Shipping Weight, Lbs.
1	No. 1 Vertical Spindle (Begins No. 1105)	12	12	30	45
2	No. 1A Standard Universal		8		
	No. 2A Standard Universal		10		
	No. 2A High Speed Universal		10		
	No. 1B Standard Plain		8		
	No. 2B Standard Plain		10		
	No. 2B High Speed Plain		10		
	No. 1 Std. Vertical Spindle		10		
	No. 2 Std. Vertical Spindle		12		
	No. 2 High Spd. Vert. Spindle		12		
3	No. 3A Standard Universal		12		
	No. 3A High Speed Universal		12		
	No. 3B Standard Plain		12		
	No. 3B High Speed Plain		12		
	No. 4A Standard Universal		14		
4	No. 4B Standard Plain		14		
	No. 3 Std. Vertical Spindle		14		

When Metric Attachment is furnished, all graduations are metric.
It is recommended that the attachment be fitted to the machine before shipment from the factory.

Micrometer Spindle Setting Attachment

For Nos. 2 Standard and 2 High Speed Vertical Spindle Milling Machines



The Micrometer Spindle Setting Attachment facilitates the performing of extremely accurate boring and milling jobs. It is of particular advantage in making jigs, fixtures and dies, and on other toolroom work requiring exceptionally accurate vertical adjustment of the spindle.

A set of eight measuring bars, varying in length from ½ to 6 inches, is furnished (special bars made to order) providing for settings, in conjunction with the micrometer head, from 0 to 6 inches by one-thousandths.

Special spring clips for holding gage blocks can be furnished when specified.

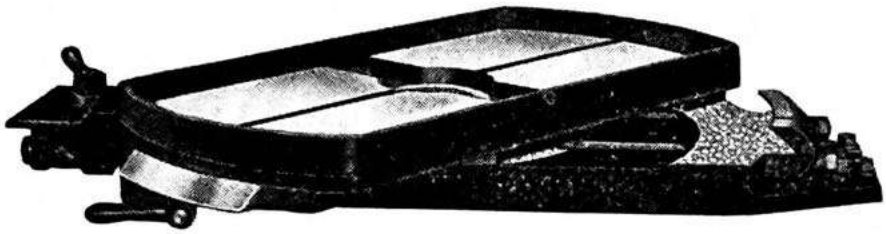
Weights: Net, 14 lbs. Shipping, 17 lbs.

It is recommended that the attachment be fitted to the machine before shipment from the factory.

Nos. 2 and 13 Index Bases

No. 2

The No. 2 Index Base is designed primarily for use on the Brown & Sharpe Plain Milling Machines which possess automatic or semi-automatic table movements. It consists of a heavy base, bolted to the table of the machine, on which is mounted a swivel. The swivel rotates very easily on a heavy pivot and is locked and held rigidly in position by a taper plunger operated by a hand lever. It can be indexed through 360°, with working positions at 0° and 180°. The contact surfaces are scraped, assuring correct alignment and rigidity.



No. 13

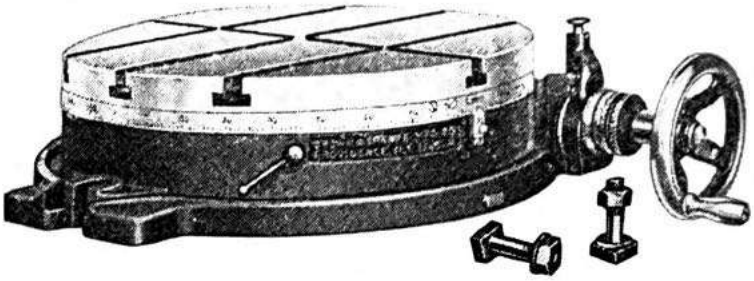
The No. 13 Index Base has its most important use on jobs when semi-automatic table movements are used, where the loading time is equal to approximately the cutting time. It is arranged with a fixture at each end of the swivel and while the work in one fixture is being milled the fixture on the other end is being loaded. Upon completion of the cut when the table returns to the loading position, the swivel is indexed, the fixture on the opposite end is brought into working position and the machine set in operation. The work is removed from the fixture on which the cut has just been made and it is reloaded preparatory to beginning the next cycle.

No. of Base	2	13
Dimensions (overall) ..... inches	12 x 23 1/8	17 5/8 x 44
Height (overall) ..... inches	4	5 1/2
Width of tongue to fit milling machine table.....	5/8 and 11/16	11/16 and 13/16
Working surface of swivel ..... inches	12 x 18	16 x 36
Width of tongue slot in swivel ..... inches	11/16	11/16
Weights { Net ..... lbs.	205	790
Weights { Shipping ..... lbs.	275	900

10 Inch and 18 Inch Rotary Attachments

Hand Feed

When ordering, give size and serial number of machine.



The table on each attachment is heavy and has a wide bearing surface. The wormwheel for rotating the table is large in diameter and is driven by a worm operated by a handwheel. The worm can be quickly disengaged from the wheel and the table turned by hand when setting work. Provision is made to compensate for wear of the worm and wheel. The table can be rigidly clamped in position by a lever on the side of the base. The circumference of the table of each attachment is graduated to half degrees, and the index finger is adjustable, permitting readings to be taken from any convenient point. The 10 inch attachment has an adjustable dial on the worm shaft that is graduated to read to 5 minutes, and the 18 inch attachment one graduated to read to 2 minutes. The 10 inch attachment is equipped with an index table mounted on the base of the attachment that gives the degrees required for setting the table to produce work with 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, and 24 sides. It is particularly valuable for use in connection with the Slotting Attachment.

Diameter of Table, Inches	Height, Inches	Width of the 2 T-slots (at right angles), Inches	Width of the 4 T-slots, Inches	Net Wt., Lbs.	Shipping Wt., Lbs.
10	4 1/4	11/16		76	91
18	4 7/8		11/16	255	295

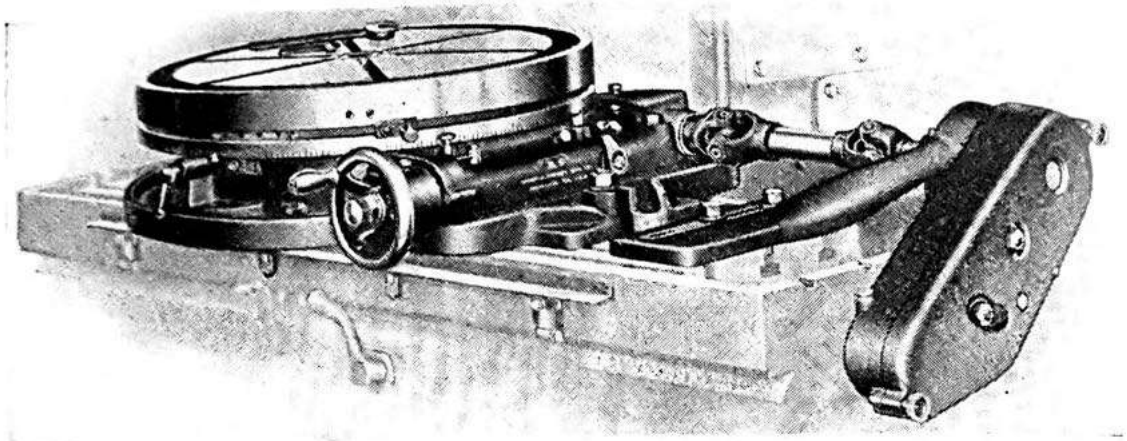
Above attachments have reversible tongues that fit T-slots either 11/16" or 13/16" wide.

No. 1 Indexing Attachment. The 18 inch Attachment is arranged to receive No. 1 Indexing Attachment, which can be furnished as an extra. The Indexing Attachment consists of index plate, index sector and crank which are mounted in place of the handwheel. The four index plates give all divisions to 100 and all even numbers to 134. Indexing table furnished gives all divisions obtainable to 380.

18 Inch and 26 Inch Rotary Attachments

Power Feed

When ordering, give size and serial number of machine.



These attachments are of heavy design and are serviceable in milling circles, segments of circles, circular slots, etc., on plain and irregular shaped pieces. When in use they are bolted securely to the table of the machine, the table being adjustable to any desired position. With a Rotary Attachment, a Vertical Spindle Milling Machine is fully equipped for all varieties of straight and circular milling within its capacity. To equip a Horizontal Spindle Milling Machine similarly, a Vertical Milling Attachment is necessary.

The table of each attachment is heavy, has a wide bearing surface, and can be rigidly clamped in position from the side of the base. The circumference is graduated to half degrees. A dial on the worm shaft is graduated to read to 2 minutes, which permits a fine adjustment.

The feed of the table is automatic in either direction, and the table remains locked in position when the feed is automatically released. The feed is taken from the machine table feed shaft, which is reversible.

The worm can be quickly disengaged from the wormwheel and the table turned by hand when setting work. Provision is made to compensate for wear of the worm and wormwheel.

The base and table have a channel cast around them to catch oil, which is then delivered to the milling machine table.

No. 2 Indexing Attachment, which can be furnished as an extra, is similar in design to the No. 1 Indexing Attachment and is readily applied to the 18 In. Rotary Attachment, P. F., by removing handwheel. The four index plates give all divisions to 100 and all even numbers to 134. Indexing table furnished gives all divisions obtainable to 380.

18 Inch Rotary Attachment

Power Feed

No.	Machine where used	Dia. of Table, In.	Height, In.	Width of Att. Table T-slots, In.	Net Wt., Lbs.	Shipping Wt., Lbs.
1	No. 2 Universal (Light Type) No. 2 Plain (Light Type) No. 1 Vertical Spindle (Begins No. 554)	18	5⅝	11/16	390	480
1S	No. 1A Standard Universal No. 2A Standard Universal No. 2A High Speed Universal No. 1B Standard Plain No. 2B Standard Plain No. 2B High Speed Plain No. 1 Standard Vertical Spdl.	18	5⅝	11/16	390	465
2	No. 3A Standard Universal No. 3A High Speed Universal No. 3B Standard Plain No. 3B High Speed Plain No. 2 Standard Vertical Spindle No. 2 High Speed Vertical Spindle No. 4A Standard Universal No. 4B Standard Plain No. 3 Standard Vertical Spindle	18	5⅝	11/16	400	500

Above attachments have reversible tongues that fit T-slots either 11/16″ or 13/16″ wide.

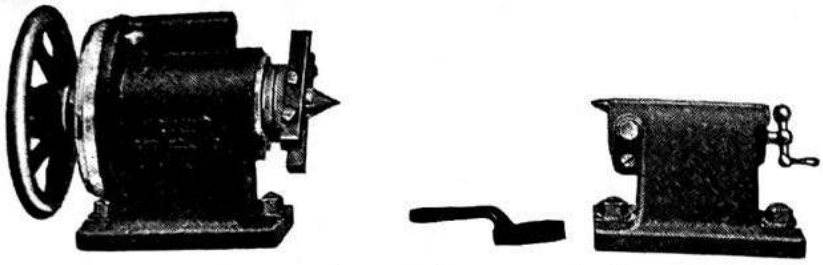
26 Inch Rotary Attachment

Power Feed

No.	Machine where used	Dia. of Table, In.	Height, In.	Width of Att. Table T-slots, In.	Net Wt., Lbs.	Shipping Wt., Lbs.
2	No. 3A Standard Universal No. 3A High Speed Universal No. 4A Standard Universal No. 3B Standard Plain No. 3B High Speed Plain No. 4B Standard Plain No. 2 Standard Vertical Spindle No. 2 High Speed Vertical Spindle No. 3 Standard Vertical Spindle	26	7¾	13/16	865	1020

Above attachment has reversible tongues that fit T-slots either 11/16″ or 13/16″ wide.
In most instances we are prepared to furnish attachments similar to those listed for older types of machines. Prices and delivery upon application.

8 Inch and 12 Inch Single Dial Index Centers



For use in rapid indexing as in cutting teeth in sprockets, etc. Swing 8″ and 12″ in diameter, respectively.

Spindle. Threaded, 8 Inch—2¼″ diameter, 4½ R.H., Ntl. Std., 12 Inch—2¾″ diameter, 4 R.H., Ntl. Std. No. 11 taper hole.

Index Plate. 24 holes. Provided with hardened bushings. Locked by hardened steel taper pin, operated by lever.

Combined Length. 8 Inch, 19¼″; 12 Inch, 21⅜″

Tongues reversible. Fit T-slots 11/16″ or 13/16″ wide.

Weights. 8 Inch—net, about 75 lbs.; ready for shipment, about 95 lbs.; 12 Inch—net, about 135 lbs.; ready for shipment, 165 lbs.

Equipment. Index plate and table explaining the use of same, wrenches and everything else shown in cut.

Special Index Plates for 8 In. and 12 In. Index Centers can be furnished with any number of holes up to and including 32.

10 Inch and 12 Inch Plain Index Centers

Centers swing 10¼″ and 12¼″ in diameter, respectively.

Spindle. Threaded, 2¼″ diameter, 4½ R.H., Ntl. Std., has No. 10 taper hole.

Wormwheel is of large diameter. Ratio of worm to wormwheel, 40:1.

Index Plates divide all numbers to 50; all even numbers to 100 except 96. Index table furnished gives all divisions obtainable to 380.

Index crank adjustable. Sector arms graduated.

Tongues reversible. Fit T-slots 11/16″ or 13/16″ wide.

Combined length of head and footstock. 10 Inch, 14⅞″; 12 Inch, 18″.

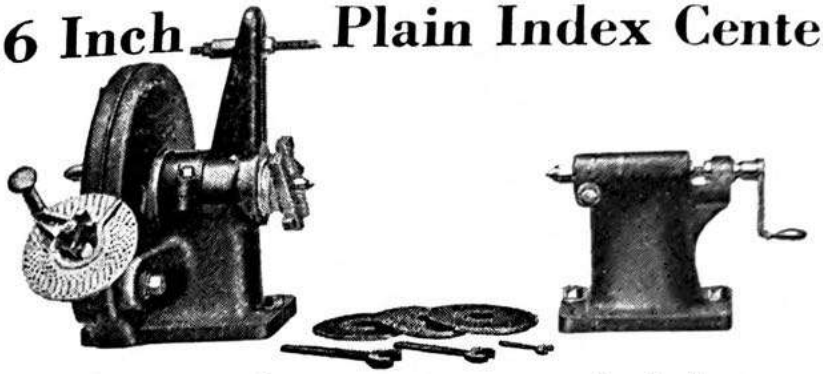
Headstock can be clamped at right angles to table.

Weights. 10 Inch—net, about 55 lbs.; ready for shipment, about 72 lbs. 12 Inch—net, about 76 lbs.; ready for shipment, about 100 lbs.

Equipment. Index plates and table explaining the use of same, wrenches and everything else shown in cut.

6″ 3-jawed Universal Chuck can be furnished as an extra.

16 Inch Plain Index Centers



This attachment is used to cut gears or wheels larger and heavier than can be cut with the usual fixtures belonging to a milling machine.

Centers swing 16″ in diameter.

Spindle. Threaded, 2½″ dia., 4 R.H., Ntl. Std., has No. 11 taper hole. Hole through, 1¼″ diameter.

An adjustable rim rest, placed on the head, is provided as a support for the gear while it is being cut.

Wormwheel is 14⅛″ diameter. Ratio of worm to wormwheel, 60:1.

Index Plates divide all numbers to 100, all even numbers to 134 and all numbers divisible by 4 to 200.

Index crank adjustable. Sector arms graduated.

Tongues reversible. Fit T-slots 11/16″ or 13/16″ wide.

Combined Length of head and footstock, 24¾″.

Weights. Net, about 196 lbs.; ready for shipment, about 250 lbs.

Equipment. Index plates and table explaining the use of same, wrenches and everything else shown in cut

No. 2½ Triple Index Centers

For Direct Indexing Only

These Index Centers are well adapted for grooving taps and reamers, milling nuts, cutting small gears and other work of a similar character.

Centers swing, using three spindles 2½″, using the two outside spindles 5″. The spindles are operated simultaneously by the movement of the index crank and clamped at one time by means of a thumb screw on front of head.

Spindles have No. 9 taper holes.

Index Plate furnished divides all numbers as follows: 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 20 and 24.

Footstock is provided with adjustable centers that can be clamped.

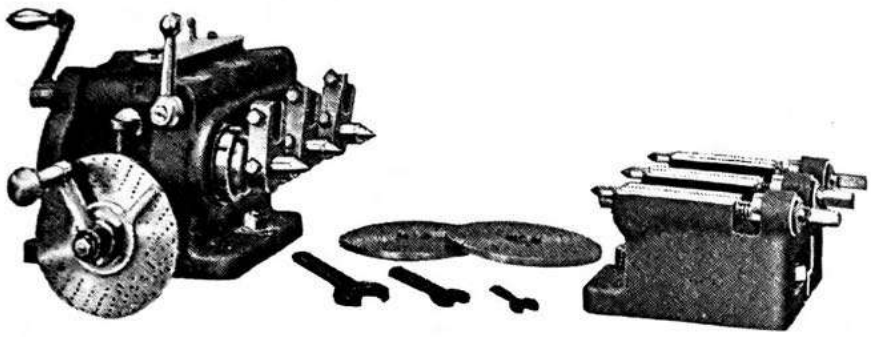
Combined Length of head and footstock, 12⅝″.

Tongues are reversible and fit T-slots either ⅝″ or 11/16″ wide.

Weights. Net, about 80 lbs.; ready for shipment, about 103 lbs.

Equipment. Index plate, wrenches and everything shown in cut.

No. 14 Triple Index Centers



Centers swing, using three spindles, 4″; using the two outside spindles, 8″.

Spindles are operated simultaneously by the movement of the index crank. The front ends are provided with No. 10 taper holes; the straight hole at end of taper is 1 1/16″ in diameter. The lever shown at one side of the head clamps all three spindles at once. Ratio of worm to wormwheel, 40:1.

Index Plates divide all numbers to 50, and all even numbers to 100 except 96. The index table furnished gives all divisions obtainable to 380. A plate containing 24 holes for rapid indexing of work is furnished, and divides the following numbers: 2, 3, 4, 6, 8, 12 and 24. When rapid or plain indexing is desired, the worm, which turns the spindle, is thrown quickly out of mesh by means of a knob on the side of the head. Sector arms graduated. Index crank adjustable.

Footstock is provided with adjustable centers that can be clamped.

Combined Length of head and footstock, 19 1/2″.

Tongues reversible. Fit T-slots 5/8″ or 3/4″ wide.

Weights. Net, about 190 lbs.; ready for shipment, about 250 lbs.

Equipment. Three index plates, table explaining the use of same, wrenches and everything else shown in cut.

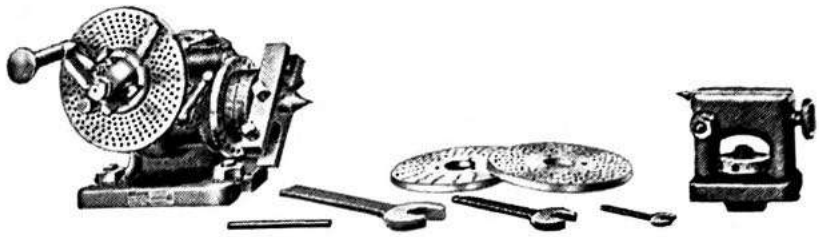
No. 4 Triple Index Centers

For Direct Indexing Only

These centers are of the same capacity and general design as the No. 14, but they are equipped for direct indexing only. Index Plate furnished has 24 holes and will divide the following numbers: 2, 3, 4, 6, 8, 12 and 24.

Equipment. Index plate, wrenches, etc.

Special Index Plates with any number of holes up to and including 32 can be furnished.



6 Inch Universal Index Centers

Centers swing 6″ in dia. Combined length of head and footstock, 12″.

Head can be set at any angle from 5 degrees below horizontal to 15 degrees beyond perpendicular. Side of head graduated to read to degrees.

Spindle. No. 9 taper hole. Straight hole at end 7/8″ dia. Threaded, 1 3/4″ diameter, 5 R.H., Ntl. Std. Ratio of worm to wormwheel, 40:1.

Footstock Center is adjustable horizontally and can be clamped.

Index Plates furnished divide all numbers to 50, and all even numbers to 100 except 96. The index table gives all divisions obtainable to 380. For rapid indexing, a 24 hole plate is placed directly on the spindle. The worm, which turns the spindle, is thrown quickly out of mesh.

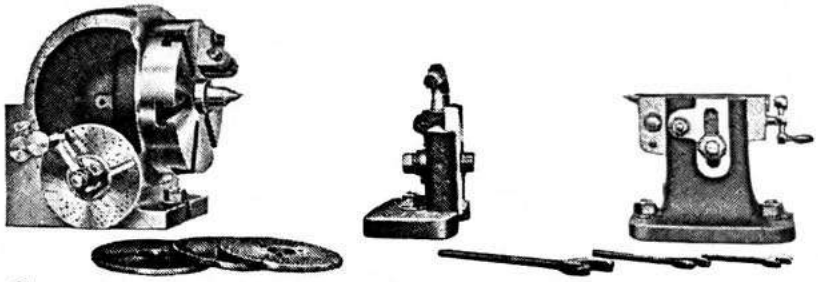
Index crank adjustable. Sector arms graduated.

Tongues reversible. Fit T-slots 5/8″ or 11/16″ wide.

Weights. Net, about 35 lbs.; ready for shipment, about 48 lbs.

Equipment. Wrenches, index plates and table explaining the use of same and everything else shown in cut.

4″ 3-jawed Universal Chuck can be furnished as an extra.



12 1/2 Inch Universal Index Centers

Centers swing 12 1/2″ in dia. Combined length, head and footstock, 18 5/8″.

Head can be set at any angle from 10 degrees below horizontal to 10 degrees beyond perpendicular. Graduations read to half degrees.

Spindle provided with face plate and adjustable dog carrier. Front end has No. 12 taper hole. Straight hole at end of taper 1 1/2″ dia.

Wormwheel of large diameter. Ratio of worm to wormwheel, 60:1.

Footstock adjustable vertically and horizontally. Can be set at an angle in a vertical plane. Index crank adjustable. Sector arms graduated.

Index Plates divide all numbers to 100, all even numbers to 134. The index table furnished gives all divisions obtainable to 380.

Center Rest will take work to 3 1/8″ in diameter.

Tongues reversible. Fit T-slots 11/16″ or 13/16″ wide.

Weights. Net, about 170 lbs.; ready for shipment, about 205 lbs.

Equipment. Index plates and table explaining the use of same, wrenches and everything else shown in cut.

9″ 3-jawed Universal Chuck can be furnished as an extra.

Universal Index Centers

The following details and specifications are common to each of the 10 Inch, 12 Inch and 14 Inch Universal Index Centers. Details wherein these centers differ are taken up individually under the respective sizes.

Index Plates divide all numbers to 50 and all even numbers to 100 except 96. The index table furnished gives all divisions obtainable to 380 A plate containing 24 holes, for rapid indexing of work, is placed directly on the spindle and the worm, which turns the spindle, is thrown quickly out of mesh by means of a knob on the side of the head.

Head can be set at any angle from 10 degrees below the horizontal to 5 degrees beyond the perpendicular. Graduated to half degrees.

Index crank adjustable. Sector arms graduated.

Footstock is adjustable vertically and horizontally and can be set at an angle in a vertical plane.

Ratio of worm to wormwheel, 40:1.

10 Inch Universal Index Centers

Centers swing 10″ in diameter.

Spindle has a No. 10 taper hole. Straight hole at end of taper 1″ in dia. Front end threaded 2¼″ dia., 4½ R.H., Ntl. Std., to receive a chuck.

Combined Length of head and footstock, 19″.

Tongues reversible. Fit T-slots ⅝″ or 11/16″ wide.

Weights. Net, about 126 lbs.; ready for shipment, about 155 lbs.

Equipment. Index plates and table explaining the use of same, wrenches and everything else shown in cut.

6″ 3-jawed Universal Chuck can be furnished as an extra.

12 Inch Universal Index Centers

Centers swing 12″ in diameter.

Spindle has a No. 11 taper hole. Straight hole at end of taper 1 3/16″ in dia. Front end threaded 2 1/2″ dia., 4 R.H., Ntl. Std., to receive a chuck or other fixture.

Combined Length of head and footstock, 21 3/4″.

Tongues reversible. Fit T-slots 5/8″ or 11/16″ wide.

Weights. Net, about 206 lbs.; ready for shipment, about 240 lbs.

Equipment. Index plates and table explaining the use of same, wrenches and everything else shown in cut.

8″ 3-jawed Universal Chuck can be furnished as an extra.

14 Inch Universal Index Centers

Centers swing 14″ in diameter.

Spindle has a No. 12 taper hole. Straight hole at end of taper 1 1/2″ in dia. Front end threaded 2 3/4″ dia., 4 R.H., Ntl. Std., to receive a chuck or other fixture.

Combined Length of head and footstock, 21 1/2″.

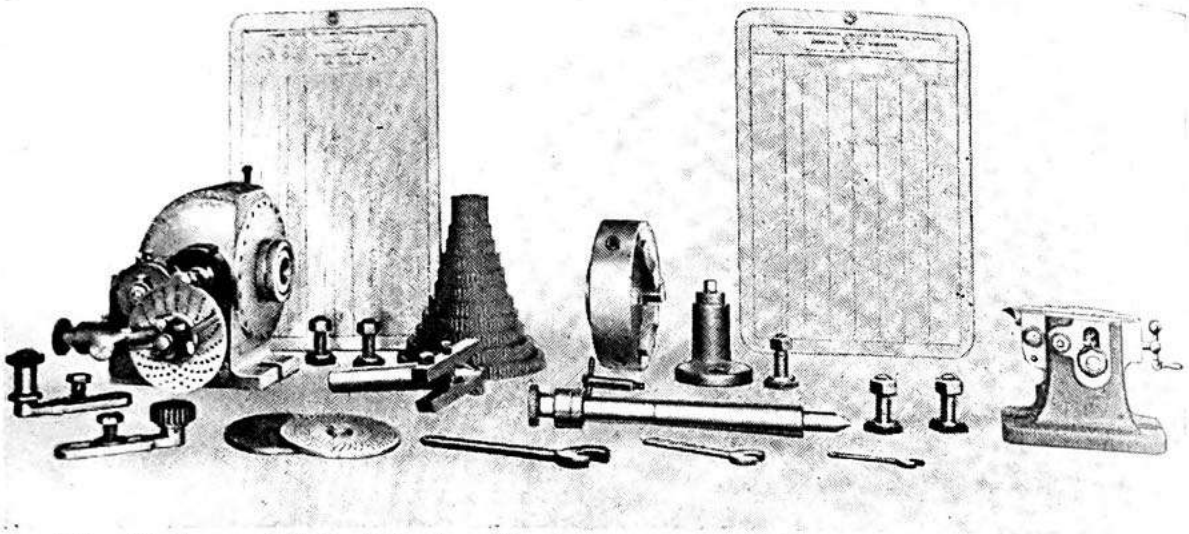
Tongues reversible. Fit T-slots 3/4″ or 13/16″ wide.

Weights. Net, about 333 lbs.; ready for shipment, about 370 lbs.

Equipment. Index plates and table explaining the use of same, wrenches and everything else shown in cut above.

9″ 3-jawed Universal Chuck can be furnished as an extra.

Universal Spiral Index Centers
Quadrant Type



The Universal Spiral Index Centers are used for supporting work that must be indexed or rotated in conjunction with the movement of the table of a milling machine. By their use even spacing on the periphery of pieces, spiral forms of all common leads, and a large variety of miscellaneous operations can be easily performed.

The spindle is rotated by means of a worm and wormwheel (ratio 40:1) which permit the head to be driven when the front end of spindle is set at any desired angle between 10° below the horizontal and 5° beyond the perpendicular. The side of the head is graduated to half degrees to show the angle of elevation, and an efficient clamp is provided.

Plain indexing is accomplished by use of the index plates furnished, as in ordinary indexing heads. Rapid indexing is provided for by a plate placed directly on the spindle and used with the head set at any angle.

Differential indexing provides for indexing all divisions to 382 and many beyond by use of the change gears and the three index plates regularly furnished.

The footstock has an adjustable center that can be elevated or depressed by means of a rack and pinion and can also be set at an angle in a vertical plane.

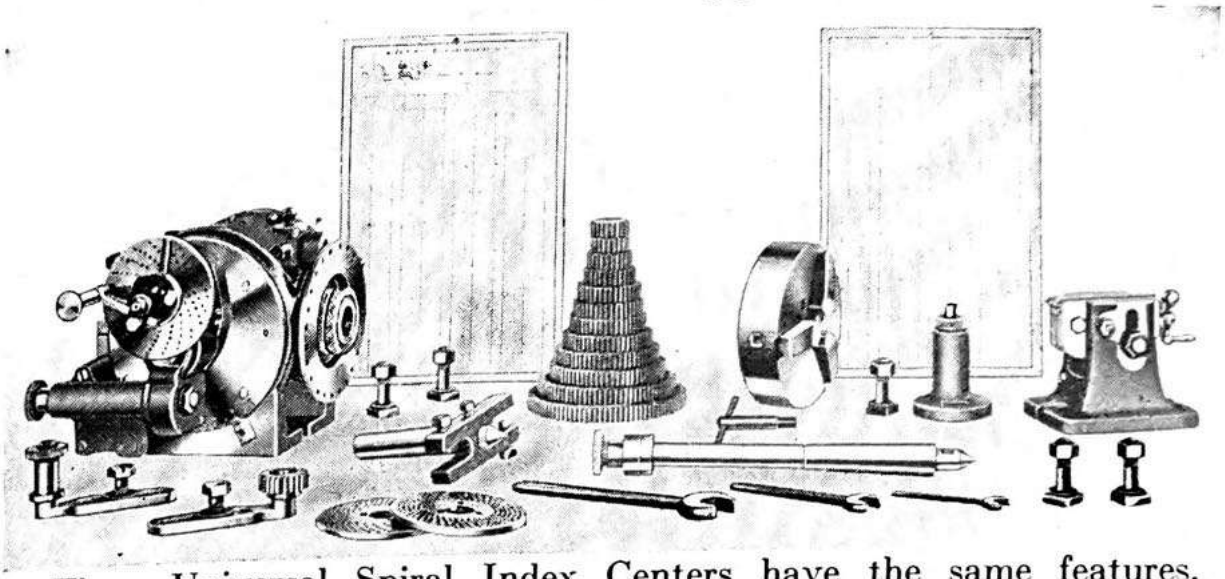
Complete specifications furnished on request.

Size, In.	Swings Diam., In.	Front End of Spindle Threaded, Ntl. Std.	Taper Hole in Spdl. No.	Hole thru Spdl., Diam., In.	Combined Length Head and Footstock, In.	Tongues and Bolts to fit T-slot, In.	Size of 3-jawed Chuck Used, In.	Net Wt., Lbs.	Shipping Wt., Lbs.
10	10	2¼" dia. 4½ R.H.	10	1 1/16	17	5/8 or 11/16	6*	165	200

*Not furnished when Set is for use on Plain Milling Machine. Complete listing of Index Plates given on page 610.

Universal Spiral Index Centers

Trunnion Type



These Universal Spiral Index Centers have the same features, methods of indexing and setting as the Quadrant Type shown on the opposite page. The head is readily held at any desired position by the full circumference clamp, making it extremely rigid for heavy work.

Complete specifications furnished on request.

Size, In.	Swings dia., In.	Front End of Spindle Threaded, Ntl. Std.	Taper Hole in Spdl. No.	Hole thru Spdl. diam., In.	Combined Length Head and Footstock, In.	Tongues and Bolts to fit T-slot, In.	Size of 3-jawed Chuck Used, In.	Net Wt., Lbs.	Shipping Wt., Lbs.
10	10	2¼" dia. 4½ R.H.	10	1	19	⅝ or 11/16	6*	186	250
12	12	2½" dia. 4 R.H.	11	1 3/16	21¾	⅝ or 11/16	8*	297	380
14	14	2¾" dia. 4 R.H.	12	1½	25	¾ or 13/16	9*	383	460

*Not furnished when Set is for use on Plain Milling Machine. Complete listing of Index Plates given on page 610.

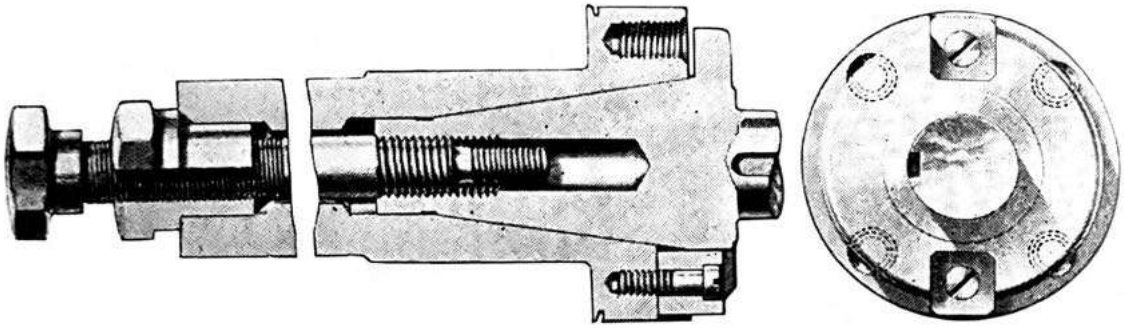
Standard Sets of Cutters and Arbors

Sets of Cutters and Arbors, consisting of stock items, are suggested to fit the milling machines for average shop work.

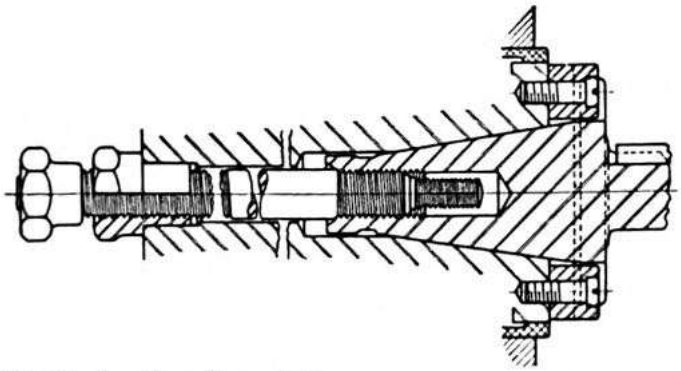
Special circular listing sets for each machine sent on request.

Standardized Spindle End

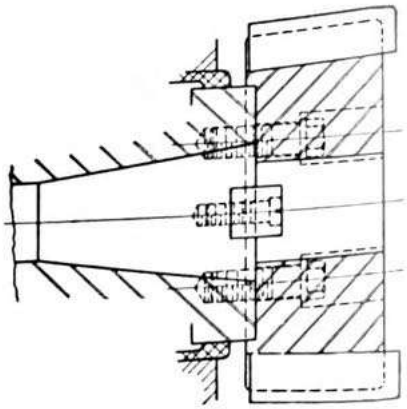
In the interest of simplified equipment and economy to milling machine users the Standardized Spindle End has been co-operatively developed after careful research and practical tests by the Milling Machine Manufacturers of the National Machine Tool Builders' Association.



Standardized Spindle End



Method of using Arbors with Standardized Spindle End



Method of using Face Milling Cutters with Standardized Spindle End

Grinding Machines

B·S

Universal

Plain Surface

Tool & Cutter

Universal & Tool

Attachments

Universal Grinding Machines

Brown & Sharpe Universal Grinding Machines are designed for general purpose cylindrical grinding—chiefly for toolroom use. They are noteworthy for their extreme simplicity, adaptability and accuracy. Attachments, both stock and special, further extend the versatility of the machines.

In their construction great care is taken in design and workmanship. The operating units—wheel stand, headstock, footstock and table—are all of the simplest possible design so that the machines may be readily set up and easily operated.

The Universal Grinding Machines are furnished in either belt driven or motor driven type.

Plain Grinding Machines

The No. 11 Plain Grinding Machine is either belt or motor driven and excels on fast production grinding of small parts. It has a wide range of speeds and feeds, and set-ups are made quickly and easily.

The Nos. 30, 32, 33 and 35 Plain Grinding Machines are heavy and powerful manufacturing machines, designed and constructed for efficient production grinding of work up to about 5″ diameter.

Full utilization of great power, weight and strength for continuous hard service, inbuilt precision, and ease of operation are their outstanding characteristics. Each machine (except No. 35) is made in three different combinations of power and hand feeds and all are either belt or motor driven.

Many important features contribute to the great productive ability of the machines. All operating controls are conveniently located and easy to use. The cross feed is extremely rugged, accurate, and sensitive. Anti-friction bearings are widely used. Speed changes are obtained through heat treated alloy steel gears mounted on splined shafts. The headstock is driven directly from within the machine without extra motor. Three changes of wheel spindle speed are provided. The wheel spindle boxes are of special construction to prevent incorrect adjustment. The wheel spindle, cross feed mechanism and table and work driving mechanism are automatically lubricated with filtered oil. On machines with traveling table, nine table speeds up to 373 inches per minute are available.

Surface Grinding Machines

Brown & Sharpe Surface Grinding Machines are among the most popular machine tools built. They are in satisfactory daily use in thousands of shops, large and small, all over the world. While primarily for toolroom use, their adaptability, accuracy, and speed and ease of operation make them valuable also for production surface grinding of small parts.

The No. 2 size is made with either automatic or hand feeds, while the No. 5 is a hydraulically operated machine for somewhat larger and heavier work. Nos. 2 and 2B can be furnished either belt or motor driven, while No. 5 is of motor drive design only.

Cutter Grinding Machine

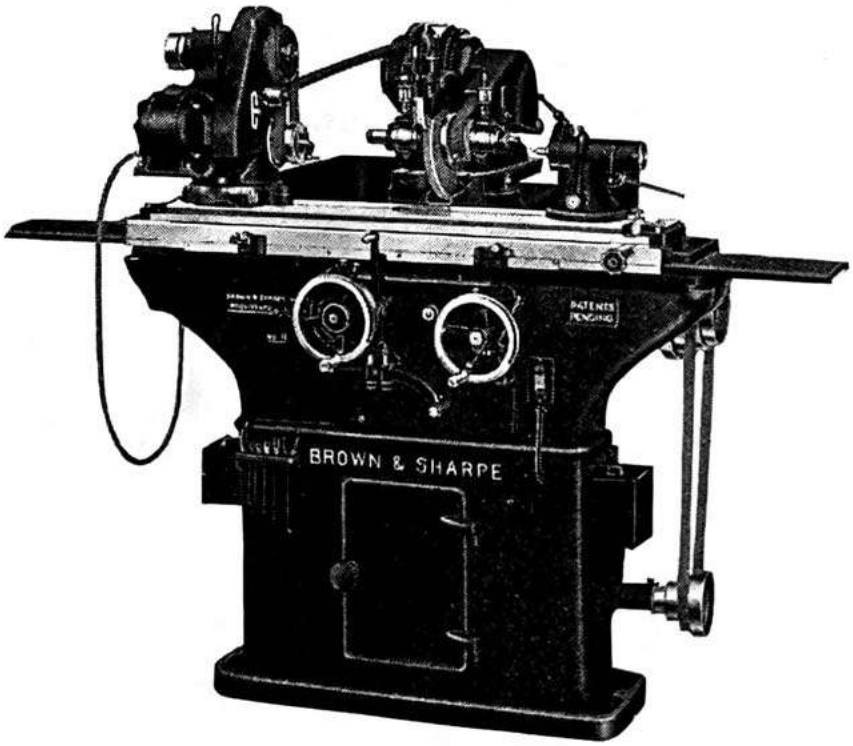
The No. 3 Universal Cutter and Reamer Grinding Machine provides efficient means of sharpening milling cutters, reamers, saws, etc. It is especially recommended for installation in milling departments for keeping cutters in condition for maximum production and is either belt or motor driven.

No. 13 Universal and Tool Grinding Machine

The No. 13 Universal and Tool Grinding Machine is a high grade, general purpose toolroom grinding machine. It is particularly adapted for sharpening milling cutters of all kinds, reamers, cutting tools, etc., and for grinding small cylindrical work.

A variety of attachments are available as extras to equip the machine for surface grinding, internal grinding, radial grinding, hob grinding and grinding the outline of formed rolls and circular forming tools. It is an unusually versatile machine and can be furnished in either belt or motor driven type.

No. 1
Universal Grinding Machine
Motor Driven



Capacity	Centers swing in diameter	10″
	Centers swing over water guards	8½″
	Centers take in length	20″
	Feeds automatic	
	Power required	1¾ H.P.

No. 1 Universal Grinding Machine

Motor Driven

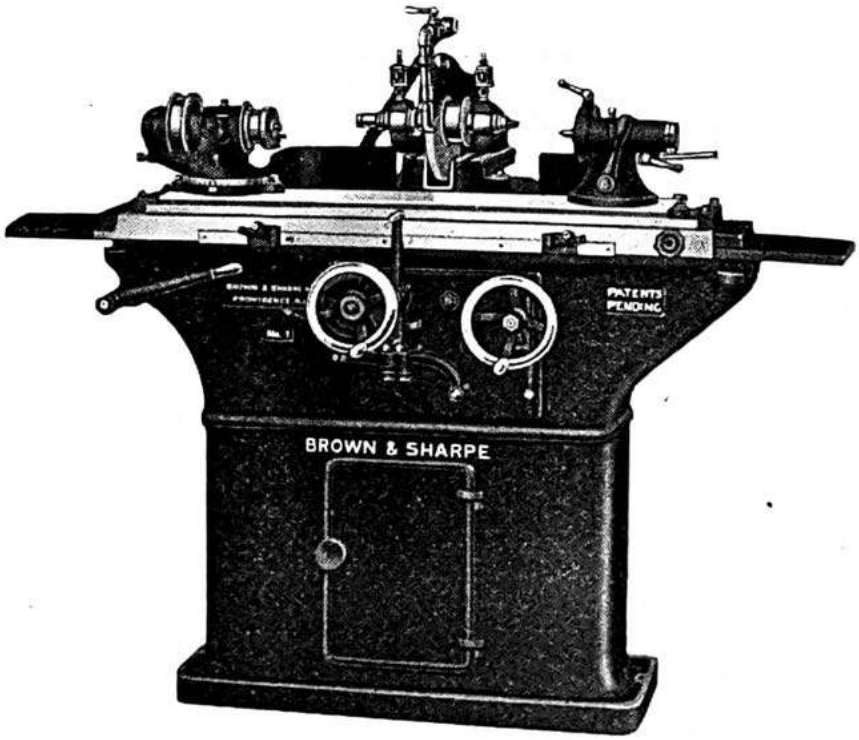
Capacity	Centers swing . . . . . diam., inches	10
	Centers swing over water guards . . . . . diam., inches	8½
	Distance between centers . . . . . inches	20
Wheel Drive	Belt width . . . . . inches	1½
	Spindle speed { Number of changes	3
	Spindle speed { Range . . . . . r.p.m.	2444, 2850, 3560
Takes Wheels To	Diameter . . . . . inches	10
	Thickness . . . . . inches	⅜ to ½
Automatic Cross Feed	Reduction in diameter of work (at either or both ends of table traverse) . . . . . inches	.00025 to .004
Swivel Table	T-slots { Number	1
	T-slots { Width . . . . . inches	9/16
	Scales graduated to . . . . . { . . . . . degrees	7
	Scales graduated to . . . . . { inches of taper per ft.	3
	Scales graduated to . . . . . { . . . . . per cent	25
Table Speed	Number of changes	8
	Range . . . . . in. per min.	3 to 51
Work Speed	Number of changes	4
	Range . . . . . r.p.m.	122 to 633
Headstock	Front end threaded	6 R.H., Ntl. Std.
	Front end diameter . . . . . inches	1½
	Taper hole . . . . . No.	6
	Swivel base scale graduated in degrees either side of zero . . . . . degrees	100
Floor Space	Parallel to spindle . . . . . inches	107
	At right angles to spindle . . . . . inches	48
Internal Grinding Fixture furnished . . . . . Catalog No.		03M
Chuck furnished (Independent 4-Jawed) . . . . . diam., inches		6
Weights (Approx.)	Fitted with Motors { Net . . . . . lbs.	2650
	Fitted with Motors { Shipping . . . . . lbs.	3100
Equipment	Face plate; face chuck; wheel truing stand; 2 universal back rests; 2 adjustable bronze shoes; center rest; 2 grinding wheels; set of dogs; set of telescopic water guards; speed change pulleys; wrenches; coolant system; and everything else shown in cuts, including three constant speed motors, controlling equipment, and wiring complete.	

Furnished as Extra—

Universal Head.

This machine is *only* furnished fitted with motors mounted at our plant.

No. 1
Universal Grinding Machine



Capacity	Centers swing in diameter	10″
	Centers swing over water guards	8½″
	Centers take in length	24″
	Feeds automatic	
	Power required	2 H.P.

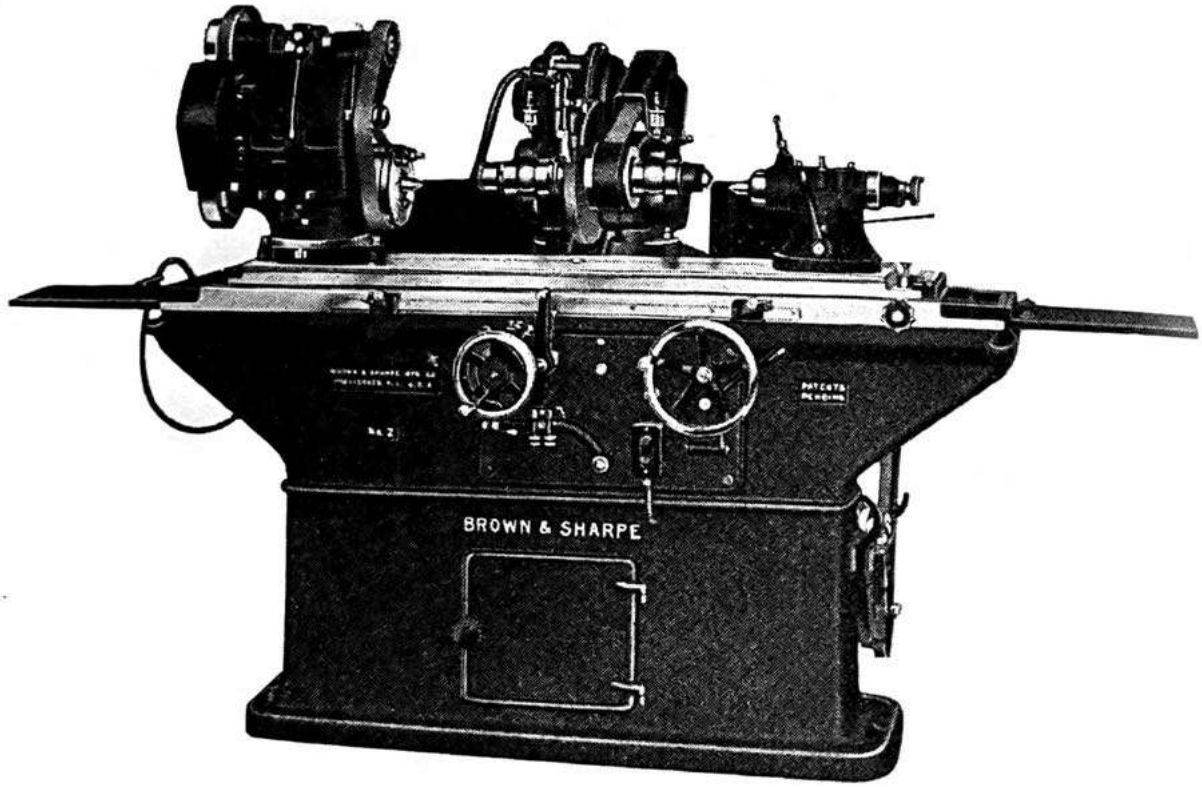
No. 1 Universal Grinding Machine

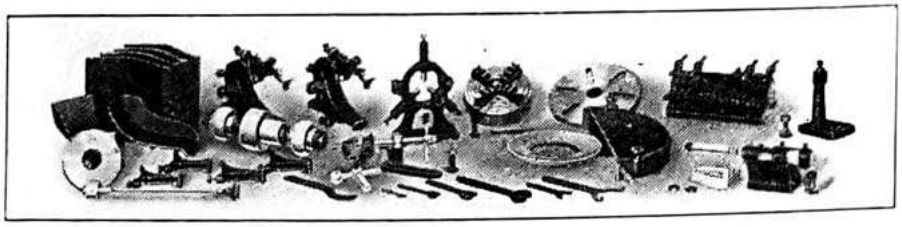
Capacity	Centers swing . . . . . diam., inches	10
	Centers swing over water guards . . . . . diam., inches	8½
	Distance between centers . . . . . inches	24
Wheel Drive	Belt Width . . . . . inches	1¼
	Spindle Speed { Number of changes	3
	Spindle Speed { Range . . . . . r.p.m.	2444, 2850, 3560
Takes Wheels To	Diameter . . . . . inches	10
	Thickness . . . . . inches	⅜ to ½
Automatic Cross Feed	Reduction in diameter of work (at either or both ends of table traverse) . . . . . inches	.00025 to .004
Swivel Table	T-slots { Number	1
	T-slots { Width . . . . . inches	9/16
	Scales graduated to . . . . . { . . . . . degrees	7
	Scales graduated to . . . . . { inches of taper per ft.	3
	Scales graduated to . . . . . { . . . . . per cent	25
Table Speed	Number of changes	8
	Range . . . . . in. per min.	3 to 50
Work Speed	Number of changes	8
	Range . . . . . r.p.m.	75 to 673
Headstock	Front end threaded	6 R.H., Ntl. Std.
	Front end diameter . . . . . inches	1½
	Taper hole . . . . . No.	6
	Swivel base scale graduated in degrees either side of zero . . . . . degrees	100
Countershaft	Tight and loose pulleys . . . . . diam., inches	8
	Belt width . . . . . inches	3
	Speed . . . . . r.p.m.	290
Internal Grinding Fixture furnished . . . . . Catalog No.		03
Chuck furnished (Independent 4-Jawed) . . . . . diam., inches		6
Floor Space	Parallel to spindle . . . . . inches	106
	At right angles to spindle . . . . . inches	49
Weights (Approx.)	Net { Machine . . . . . lbs.	2225
	Net { Countershaft . . . . . lbs.	525
	Shipping (including countershaft) . . . . . lbs.	3250
Equipment	Countershaft for use with Internal Grinding Fixture; face plate; face chuck; wheel truing stand; 2 universal back rests; 2 adjustable bronze shoes; center rest; 2 grinding wheels; set of dogs; set of telescopic water guards; wrenches; coolant system; and everything else shown in cuts together with overhead works.	

Furnished as Extra—

Universal Head.

No. 2
Universal Grinding Machine
Motor Driven





Capacity	Centers swing in diameter	12″
	Centers swing over water guards	10¾″
	Centers take in length	30″
	Feeds automatic	
	Power required	4¼ H.P.

No. 2 Universal Grinding Machine

Motor Driven

Capacity	Centers swing . . . . . diam., inches	12
	Centers swing over water guards . . . . . diam., inches	10¾
	Distance between centers . . . . . inches	30
Wheel Drive	Belt width . . . . . inches	2⅜
	Spindle Speed { Number of changes	3
	Spindle Speed { Range . . . . . r.p.m.	1760, 1975, 2250
	Additional spindle speed obtained by using 7″ change pulley intended for Internal Grinding. (For wheels of less than 9″ diameter.) . . . . . r.p.m.	2680
Takes Wheels To	Diameter . . . . . inches	12
	Thickness . . . . . inches	½ to 1
Cross Feeds	Hand — Fine and coarse.	
	Auto. — Reduction in diameter of work (at either or both ends of table traverse) . . . . . inches	.00025 to .004
Swivel Table	T-slots { Number	1
	T-slots { Width . . . . . inches	¾
	Scales graduated to . . . . . { . . . . . degrees	8
	Scales graduated to . . . . . { inches of taper per ft.	3½
	Scales graduated to . . . . . { . . . . . per cent	30
Table Speed	Number of changes	10
	Range . . . . . in. per min.	1½ to 53
Work Speed	Number of changes	6
	Range . . . . . r.p.m.	64 to 360
Headstock	Front end threaded	4½R.H., Ntl. Std.
	Front end diameter . . . . . inches	2
	Taper hole . . . . . No.	9
	Swivel base scale graduated in degrees either side of zero . . . . . degrees	100
Internal Grinding Fixture furnished . . . . . Catalog No.		4
Chuck furnished (Independent 4-Jawed) . . . . . diam., inches		8
Floor Space	Parallel to spindle . . . . . inches	137
	At right angles to spindle . . . . . inches	60
Weights (Approx.)	Fitted with Motors { Net . . . . . lbs.	4825
	Fitted with Motors { Shipping . . . . . lbs.	5425
Equipment	Countershaft for use with Internal Grinding Fixture; face plate; face chuck; wheel truing stand; 2 universal back rests; 4 adjustable bronze shoes; center rest; 2 grinding wheels; wheel sleeve; set of dogs; set of telescopic water guards; wrenches; pulleys for obtaining speed changes of headstock and wheel spindle; coolant system; and everything else shown in cuts, including three constant speed motors, controlling equipment and wiring complete.	

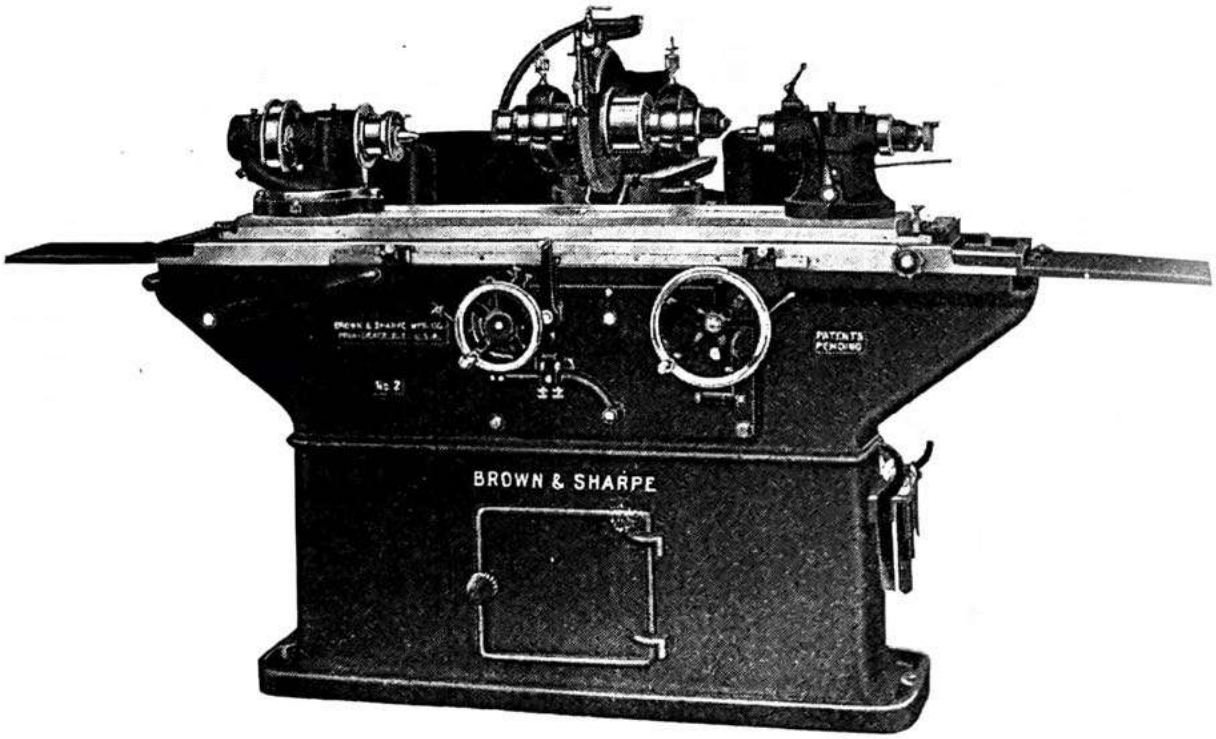
Furnished as Extra—

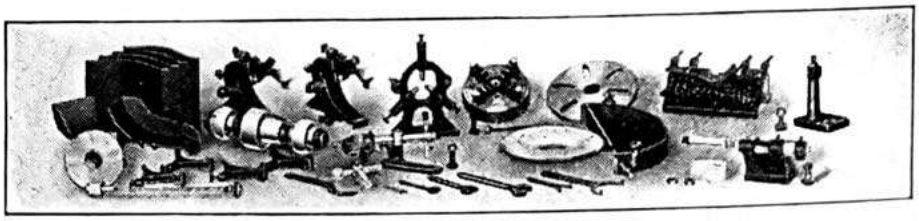
Guard and Wheel Sleeve for use when wheel is used on the right hand end of spindle.

Universal Head.

This machine is *only* furnished fitted with motors mounted at our plant.

No. 2
Universal Grinding Machine





Capacity	Centers swing in diameter	12″
	Centers swing over water guards	10¾″
	Centers take in length	30″
	Feeds automatic	
	Power required	5 H.P.

No. 2 Universal Grinding Machine

Capacity	Centers swing . . . . . diam., inches	12
	Centers swing over water guards . . . . . diam., inches	10¾
	Distance between centers . . . . . inches	30
Wheel Drive	Belt width . . . . . inches	2½
	Spindle Speed { Number of changes	3
	Spindle Speed { Range . . . . . r.p.m.	1521, 1866, 2343
	Additional spindle speed obtained by using step of cone pulley intended for Internal Grinding. (For wheels of less than 9″ diameter.) . . . . . r.p.m.	2939
Takes Wheels To	Diameter . . . . . inches	12
	Thickness . . . . . inches	½ to 1
Cross Feeds	Hand — Fine and coarse.	
	Auto. — Reduction in diameter of work (at either or both ends of table traverse) . . . . . inches	.00025 to .004
Swivel Table	T-slots { Number	1
	T-slots { Width . . . . . inches	¾
	Scales graduated to . . . . . { . . . . . degrees	8
	Scales graduated to . . . . . { inches of taper per ft.	3½
	Scales graduated to . . . . . { . . . . . per cent	30
Table Speed	Number of changes	10
	Range . . . . . in. per min.	1½ to 50
Work Speed	Number of changes	12
	Range . . . . . r.p.m.	39 to 645
Headstock	Front end threaded	4½R.H.,Ntl. Std.
	Front end diameter . . . . . inches	2
	Taper hole . . . . . No.	9
	Swivel base scale graduated in degrees either side of zero . . . . . degrees	100
Countershaft	Tight and loose pulleys . . . . . diam., inches	12
	Belt width . . . . . inches	3½
	Speed . . . . . r.p.m.	310
Internal Grinding Fixture furnished . . . . . Catalog No.		4
Chuck furnished (Independent 4-Jawed) . . . . . diam., inches		8
Floor Space	Parallel to spindle . . . . . inches	137
	At right angles to spindle . . . . . inches	53
Weights (Approx.)	Net { Machine . . . . . lbs.	4125
	Net { Countershaft . . . . . lbs.	910
	Shipping (including countershaft) . . . . . lbs.	5700
Equipment	Countershaft for use with Internal Grinding Fixture; face plate; face chuck; wheel truing stand; 2 universal back rests; 4 adjustable bronze shoes; center rest; 2 grinding wheels; wheel sleeve; set of dogs; set of telescopic water guards; wrenches; coolant system; and everything else shown in cuts, together with overhead works.	

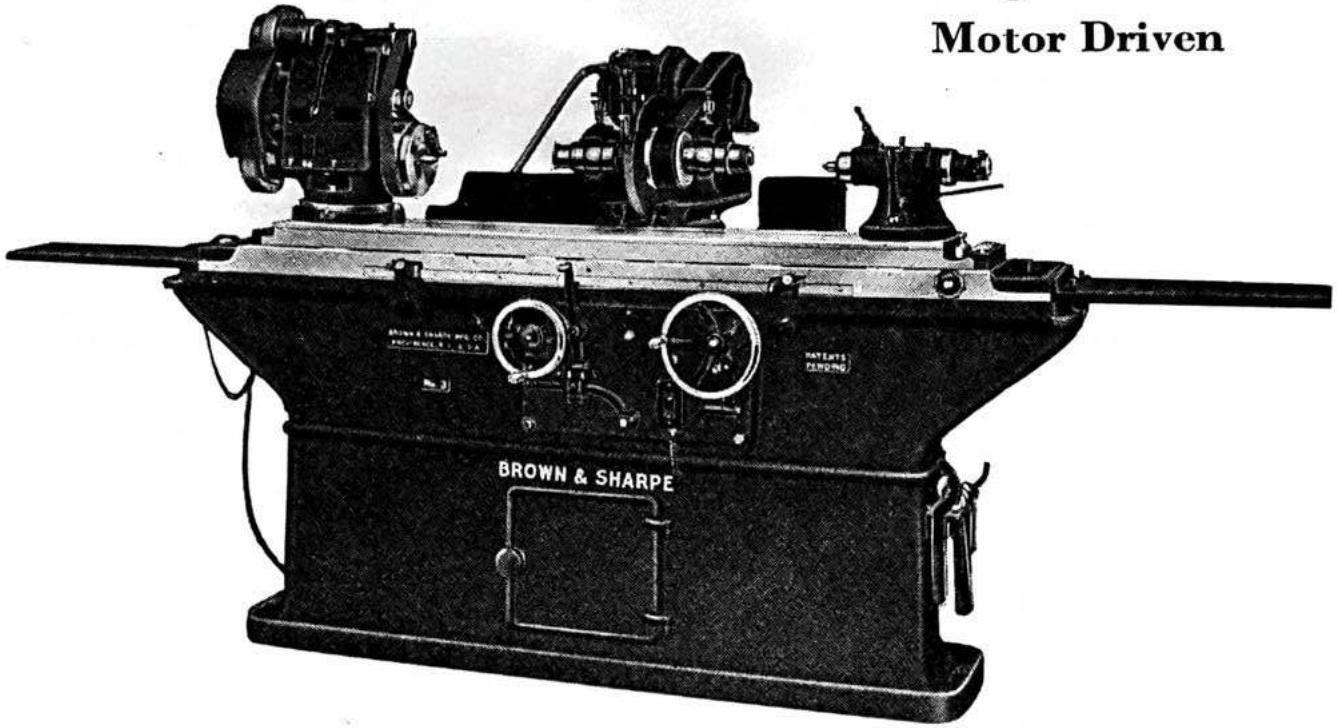
Furnished as Extra—

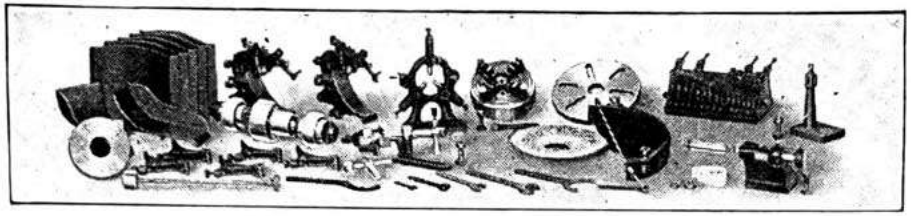
Guard and wheel sleeve for use when wheel is used on the right hand end of spindle.

Universal Head.

Nos. 3 and 4 Universal Grinding Machines

Motor Driven





No. 3 shown

		No. 3	No. 4
Capacity	Centers swing in diameter	12″	12″
	Centers swing over water guards	10¾″	10¾″
	Centers take in length	40″	60″
	Feeds automatic		
	Power required	1¼ H.P.	1¼ H.P.

Nos. 3 and 4 Universal Grinding Machines

Motor Driven

		No. 3	No. 4
Capacity	Centers swing . . . . . diam., inches	12	12
	Centers swing over water guards . . . . . diam., inches	10¾	10¾
	Distance between centers . . . . . inches	40	60
Wheel Drive	Belt width . . . . . inches	2⅜	2⅜
	Spdl. Speed { Number of changes	3	3
	Spdl. Speed { Range . . . . . r.p.m.	1760, 1975, 2250	1760, 1975, 2250
	Additional spindle speed obtained by using 7″ change pulley intended for Internal Grinding. (For wheels of less than 9″ diameter.) . . r.p.m.	2680	2680
Takes Wheels To	Diameter . . . . . inches	12	12
	Thickness . . . . . inches	½ to 1	½ to 1
Automatic Cross Feed	Reduction in diameter of work (at either or both ends of table traverse) . . . . . inches	.00025 to .004	.00025 to .004
Swivel Table	T-slots { Number	1	1
	T-slots { Width . . . . . inches	¾	¾
	Scales graduated to { . . . . . degrees	8	6
	Scales graduated to { inches of taper per ft.	3½	2½
	Scales graduated to { . . . . . per cent	29	21
Table Speed	Number of changes	10	10
	Range . . . . . in. per min.	1½ to 53	1½ to 53
Work Speed	Number of changes	6	6
	Range . . . . . r.p.m.	64 to 360	64 to 360
Headstock	Front end threaded	4½ R.H.Ntl.Std.	4½ R.H.Ntl.Std.
	Front end diameter . . . . . inches	2	2
	Taper hole . . . . . No.	9	9
	Swivel base scale graduated in degrees either side of zero . . . . . degrees	100	100
Internal Grinding Fixture furnished . . . . . Catalog No.		4	4
Chuck furnished (Independent 4-Jawed) . diam., inches		8	8
Floor Space	Parallel to spindle . . . . . inches	171	209
	At right angles to spindle . . . . . inches	60	60
Weights (Approx.)	Fitted with motors { Net . . . . . lbs.	5470	6825
	Fitted with motors { Shipping . . . . . lbs.	5900	7750
Equipment	Countershaft for use with Internal Grinding Fixture; wheel truing stand; face plate; face chuck; 2 universal back rests; 4 adjustable bronze shoes; center rest; 2 grinding wheels; wheel sleeve; set of dogs; set of telescopic water guards; wrenches; pulleys for obtaining speed changes of headstock and wheel spindle; coolant system; and everything else shown in cuts including three constant speed motors, controlling equipment and wiring complete.		

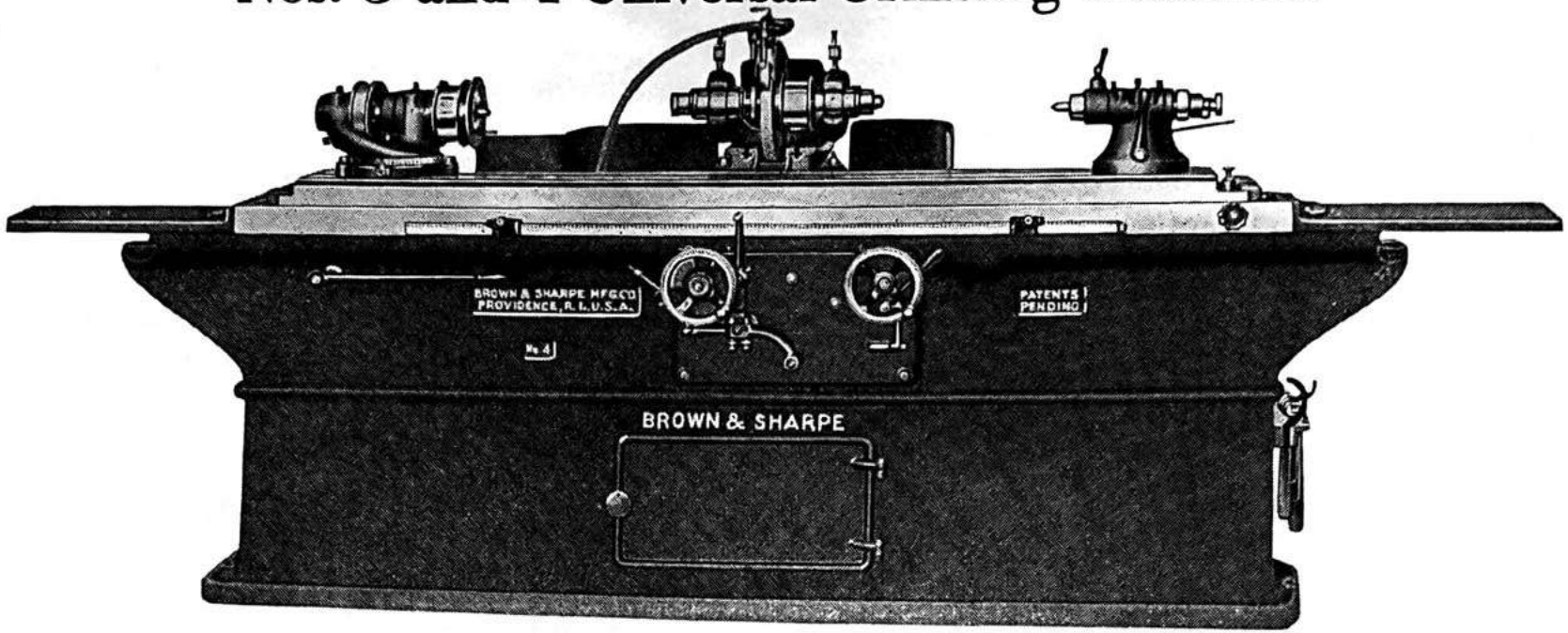
Furnished as Extra—

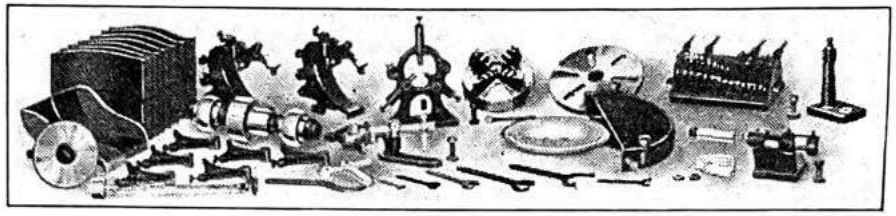
Guard and Wheel Sleeve for use when wheel is used on right hand end of spindle.

Universal Head.

These machines are *only* furnished fitted with motors mounted at our plant.

Nos. 3 and 4 Universal Grinding Machines





No. 4 shown

		No. 3	No. 4
Capacity	Centers swing in diameter	12″	12″
	Centers swing over water guards	10¾″	10¾″
	Centers take in length	40″	60″
	Feeds automatic		
	Power required	5 H.P.	5 H.P.

Nos. 3 and 4 Universal Grinding Machines

		No. 3	No. 4
Capacity	Centers swing . . . . . .diam., inches	12	12
	Centers swing over water guards . . . . . .diam., inches	10¾	10¾
	Distance between centers . . . . . .inches	40	60
Wheel Drive	Belt width . . . . . .inches	2½	2½
	Spdl. Speed {Number of changes	3	3
	Spdl. Speed {Range . . . . . .r.p.m.	1521,1866,2343	1521, 1866, 2343
	Additional spindle speed obtained by using step of cone pulley intended for Internal Grinding. (For wheels of less than 9″ diameter.) . . . . . .r.p.m.	2939	2939
Takes Wheels To	Diameter . . . . . .inches	12	12
	Thickness . . . . . .inches	½ to 1	½ to 1
Automatic Cross Feed	Reduction in diameter of work (at either or both ends of table traverse) . . . . . .inches	.00025 to .004	.00025 to .004
Swivel Table	T-slots {Number	1	1
	T-slots {Width . . . . . .inches	¾	¾
	Scales graduated to {. . . . . .degrees	8	6
	Scales graduated to {in. of taper per ft.	3½	2½
	Scales graduated to {. . . . . .per cent	29	21
Table Speed	Number of changes	10	10
	Range . . . . . .in. per min.	1½ to 50	1½ to 50
Work Speed	Number of changes	12	12
	Range . . . . . .r.p.m.	39 to 645	39 to 645
Headstock	Front end threaded	4½R.H.,Ntl.Std.	4½R.H.,Ntl.Std.
	Front end diameter . . . . . .inches	2	2
	Taper hole . . . . . .No.	9	9
	Swivel base scale graduated in degrees either side of zero . . . . . .degrees	100	100
Countershaft	Tight and loose pulleys. . .diam., inches	12	12
	Belt width . . . . . .inches	3½	3½
	Speed . . . . . .r.p.m.	310	310
Internal Grinding Fixture furnished . . . . . .Catalog No.		4	4
Chuck furnished (Independent 4-Jawed) :diam., inches		8	8
Floor Space	Parallel to spindle . . . . . .inches	171	209
	At right angles to spindle . . . . . .inches	54	54
Weights (Approx.)	Net {Machine . . . . . .lbs.	4770	6025
	Net {Countershaft . . . . . .lbs.	925	925
	Shipping (including countershaft) . .lbs.	6360	7875
Equipment	Countershaft for use with Internal Grinding Fixture; wheel truing stand; face plate; face chuck; 2 universal back rests; 4 adjustable bronze shoes; center rest; 2 grinding wheels; wheel sleeve; set of dogs; set of telescopic water guards; wrenches; coolant system; and everything else shown in cuts, together with overhead works.		

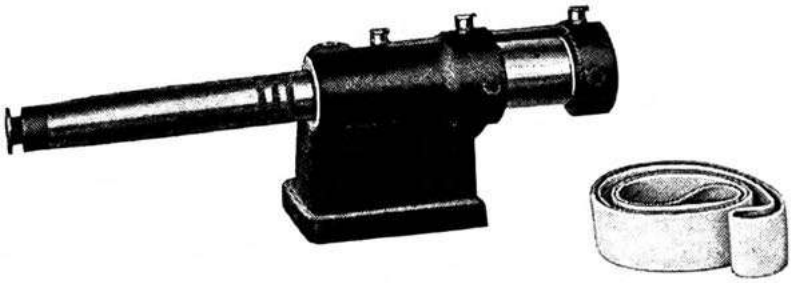
Furnished as Extra—

Guard and Wheel Sleeve for use when wheel is used on the right-hand end of spindle.

Universal Head.

Internal Grinding Fixtures

For Universal Grinding Machines



These fixtures consist of a grinding wheel spindle mounted in an adjustable bearing, which is carried by telescopic tubes adjustable longitudinally, relative to each other, to furnish a support for the spindle in close proximity to the grinding wheel. The pulley spindle is mounted in annular ball bearings which take the pull of the belt.

No. of Fixture	No. of Belt Drive Mach. where used	No. of Motor Drive Mach. where used	Distance Bot. of Stand to Center of Spdl., In.	Length that can be Ground, In.	Diameter of Hole that can be Ground, In.	Dia. Hole in Wheel, In.	Wheel Speed, R.P.M.	Weights	
								Net Lbs.	Shipping Lbs.
*01	1, 13	13	3	1½	¼ to ½	3/32	22,500	10	14
*01M		1	3	1½	¼ to ½	3/32	22,500	21	27½
* 1	2, 3, 4	2, 3, 4	4⅝	1½	¼ to ½	3/32	22,500	12	17
02	1, 13	13	3	3¾	½ to ⅞	¼	18,000	10	16
02M		1	3	3¾	½ to ⅞	¼	18,000	23	31
2	2, 3, 4	2, 3, 4	4⅝	3¾	½ to ⅞	¼	18,000	12½	19
†03	1, 13	13	3	5¼	¾ to 1⅛	¼	15,700	10	16½
††03M		1	3	5¼	¾ to 1⅛	¼	15,700	24½	31
3	2, 3, 4	2, 3, 4	4⅝	5¼	¾ to 1⅛	¼	15,700	13	21
04	1, 13	13	3	6	1⅛ and upwards	⅝	15,000	16	23
04M		1	3	6	1⅛ and upwards	⅝	15,000	27	37
‡ 4	2, 3, 4	2, 3, 4	4⅝	6	1⅛ and upwards	⅝	15,000	16	24
5	2, 3, 4	2, 3, 4	4⅝	8	1⅞ and upwards	¾	10,300	26	37

One fixture is included with each Universal Grinding Machine. Other sizes may be substituted. Special sizes made to order.

*The Nos. 01, 01M, and 1 fixtures differ in design from the cut and are provided with three grinding wheels and wheel arbors of varying lengths.

†Furnished with belt driven No. 1 Universal Grinding Machine and with Internal Grinding Attachment for No. 13 Universal and Tool Grinding Machine.

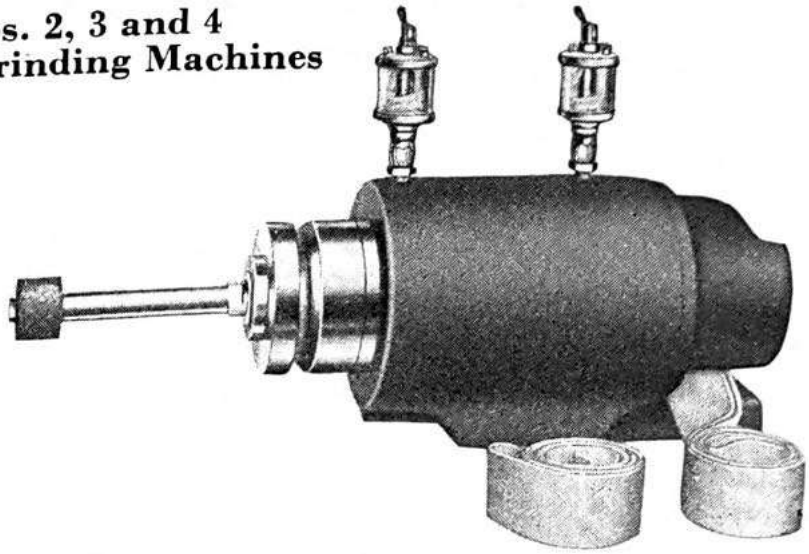
††Furnished with No. 1 Universal Grinding Machine (Motor Driven).

‡Furnished with Nos. 2, 3 and 4 Universal Grinding Machines.

No. 42 Internal Grinding Fixture

Ball Bearing Type

For Nos. 2, 3 and 4 Universal Grinding Machines



This Internal Grinding Fixture is ruggedly designed for production grinding of holes of various diameters and depths. The body, massive to absorb vibration, contains the spindle which runs at 12,000 R.P.M. on ball bearings under constant, predetermined load. This automatically compensates for any expansion or contraction due to heating. The wheel arbor is seated by a taper and held by its threaded end in the spindle.

The correct Wheel Arbor and Grinding Wheel should be used on each job. Wheel Arbors and Grinding Wheels are not furnished with the Internal Grinding Fixture. Stock sizes are listed below.

Weights: Net, 90 lbs., Shipping, 110 lbs.

Wheel Arbors and Grinding Wheels

For No. 42 Internal Grinding Fixture

One Grinding Wheel furnished with each Wheel Arbor

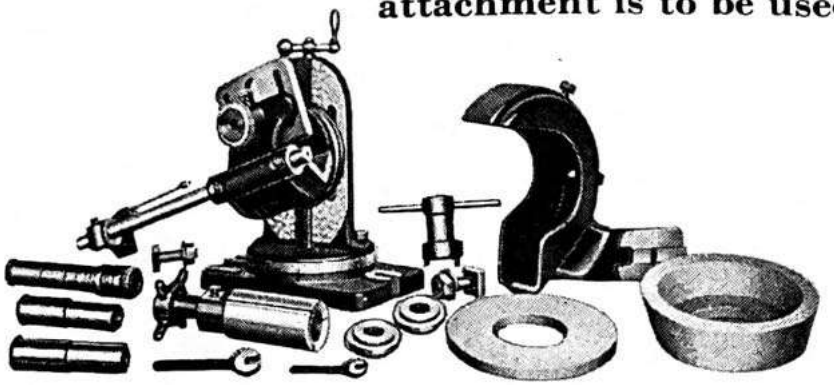
Wheel Arbor		Length that can be ground, Inches*	Minimum diam. of hole that can be ground, Inches	Takes wheels with hole diam., In.	Grinding Wheels
Size	Diameter, Inches				Size, Inches Diam. Thick. Hole
½ x 1⅝ ½ x 2⅝	½	1⅝ 2⅝	9/16	¼	1 x ½ x ¼
⅝ x 1⅝ ⅝ x 3⅛	⅝	1⅝ 3⅛	11/16	⅜	1 x ¾ x ⅜ 1½ x 1 x ⅜
¾ x 2⅛ ¾ x 4⅛	¾	2⅛ 4⅛	13/16	⅜	
⅞ x 3⅛ ⅞ x 4⅝	⅞	3⅛ 4⅝	15/16	⅝	1½ x 1 x ⅝ 2 x 1 x ⅝ 2½ x 1 x ⅝
1 x 3 1 x 5	1	3 5	1 1/16	⅝	

*This dimension is from back face of wheel to shoulder.

Universal Head

For Universal Grinding Machines

In ordering, specify machine and serial number on which attachment is to be used.



This attachment furnishes effective means for holding tools, milling cutters, countersinks, counterbores, etc., while being ground. Work having either straight or taper shanks or holes for mounting upon arbors or bushings, can be accommodated.

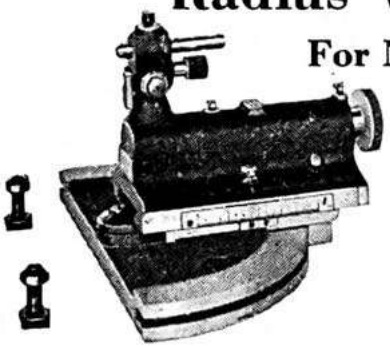
It is made in three styles, to fit the No. 1 Universal Grinding Machine; the Nos. 2, 3 and 4 Universal Grinding Machines, and the No. 13 Universal and Tool Grinding Machine with which machine it is part of the regular equipment.

Capacity	Swings over table . . . . . diam., inches Swings light work, head rt. angles to table. diam., inches	16 24
Vert. Column	Swivels. Base graduated either side of zero to . . degrees	180
Swivel Head	Adjustable either side of zero in vertical plane to . . deg. Vertical adjustment . . . . . inches	90 4
Weights (Approx.)	Net . . . . . lbs. Shipping . . . . . lbs.	70 105
Equipment	Everything shown in cuts.	

Bushings for Nos. 10, 20 or 30 Milling Machine Standard taper shanks can be furnished as extra.

Radius Wheel Truing Attachment

For Nos. 2, 3 and 4 Universal Grinding Machines



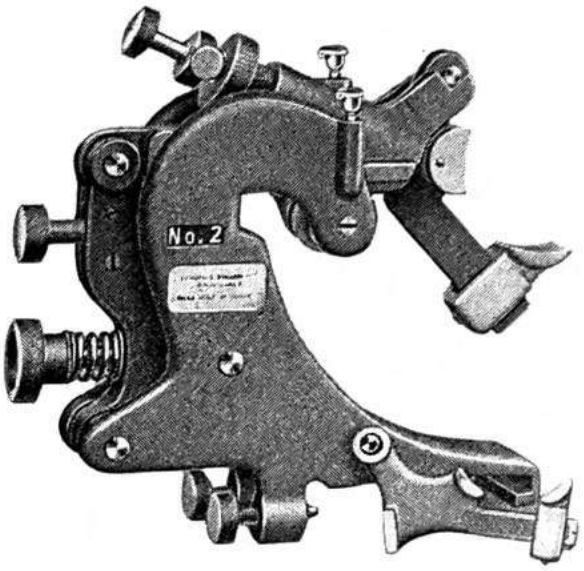
Abrasive wheels used on Universal Grinding Machines can be accurately and efficiently formed with this attachment. It is particularly desirable when shaping wheels for grinding formed rolls, concave rolls, fillets and rounds on the shoulders of cylindrical work and pieces requiring wheels of radial form.

Capacity	Convex outlines, maximum radius . . . . . inches Concave outlines, maximum radius . . . . . inches	2 2
Slide	Scale graduated by 64ths either side of zero to . . inches	2
Weights (Approx.)	Net . . . . . lbs. Shipping . . . . . lbs.	25 32

Diamond can be furnished as extra.

Universal Back Rests

Spring Type



By properly supporting the work when it is being ground, Universal Back Rests with interchangeable solid and adjustable bronze shoes increase the range and improve the quality of work that can be produced by a grinding machine. The rests are equally as valuable on short as well as long work. They prevent vibration when taking heavy cuts under rapid table feeds.

No.	Machine Where Used
1	No. 1 Universal
2	Nos. 2, 3 and 4 Universal
11	Nos. 10 and 11 Plain

Bronze Shoes can be furnished as extra (see listing below).

Bronze Shoes

Solid. The solid shoes are adapted for work requiring a fine degree of accuracy, for shafts that are key-seated, and all work under 1″ diameter. Complete list of sizes on request.

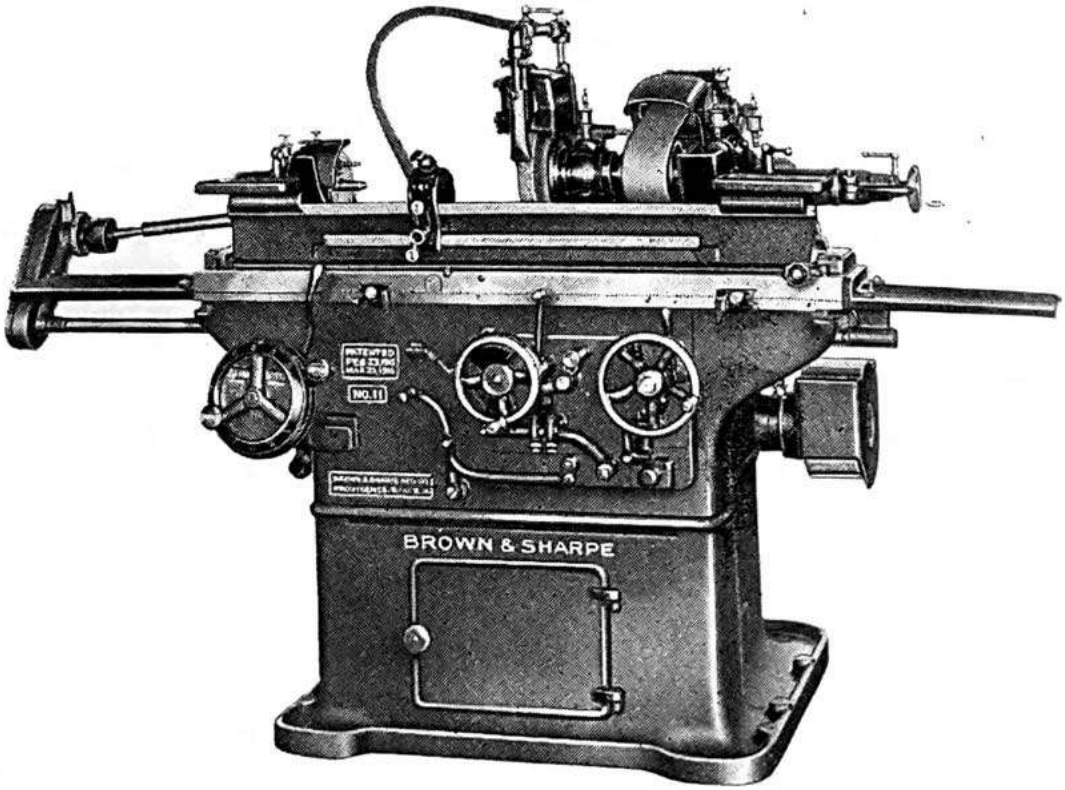
Adjustable. These adjustable shoes can be easily and quickly adjusted to any diameter of work within their capacity. They are intended for use in rapid commercial grinding and are designed to be interchangeable in the same bearings with the Solid Bronze Shoes. Complete list of sizes on request.

Spring Chuck No. 350

For No. 1 Universal Grinding Machine

Holds conveniently bushings, needle valves, wire, long thin rods, etc., through headstock. A No. 11 Spring Collet is held in place by a knurled nut that forces it against a taper seat and closes the chuck concentrically. See page 554.

No. 11
Plain Grinding Machine



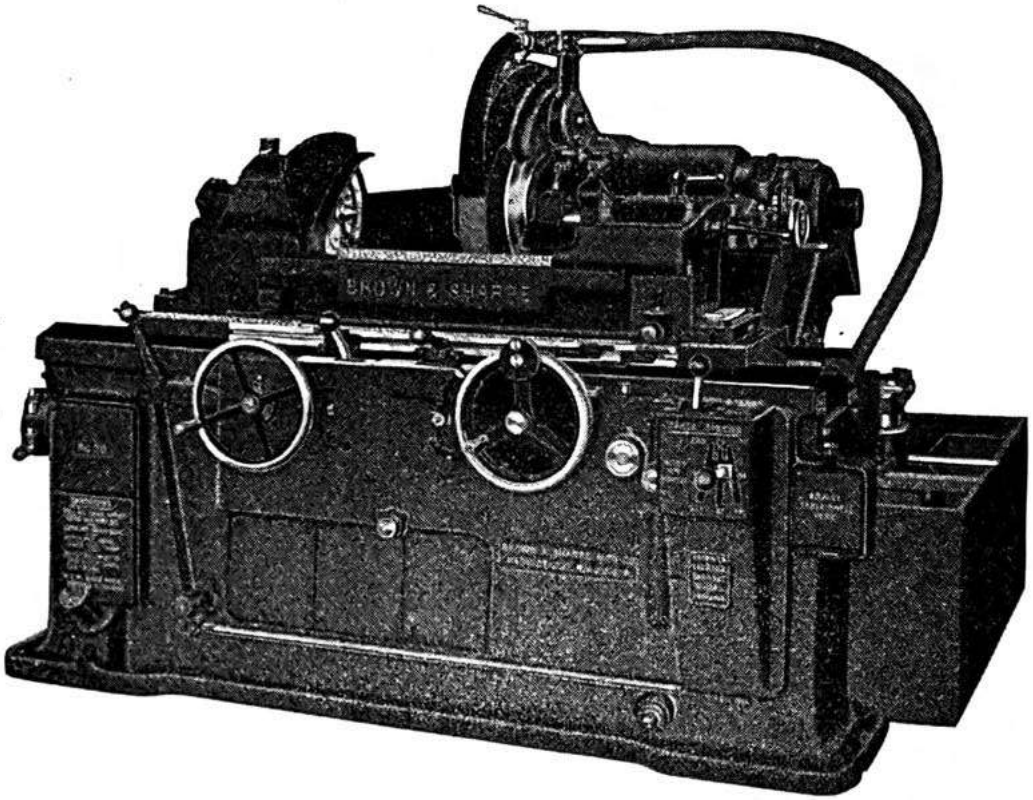
Capacity	Centers swing in diameter	6″
	Centers take in length	30″
	Feeds automatic	
	Power required	7½ H.P.

No. 11 Plain Grinding Machine

Capacity		Centers swing ..... diam., inches	6
		Distance between centers ..... inches	30
Drive	Motor	By belt ..... width, inches	4½
	Overhead	Main driving shaft speed ..... r.p.m.	900
		Pulley ..... diam., inches	10
		Width of belt ..... inches	4½
Wheel Drive		Belt width ..... inches	4
		Spindle Speed: Number of changes	5
		Spindle Speed: Range ..... r.p.m.	1340 to 1995
Takes Wheels To		Diameter ..... inches	14
		Thickness ..... inches	1 to 2
Automatic Cross Feed		Indicated changes of wheel feed for each work speed	12
		Reduction in diameter of work (at either or both ends of table traverse) ..... inches	.00025 to .004
Independent Automatic Cross Feed		Indicated changes of wheel feed for each work speed	12
		Reduction in diameter of work for each movement of wheel slide ..... inches	.00025 to .004
Swivel Table		Scales graduated to ..... degrees	7
		Scales graduated to ..... in. of taper per ft.	3
		Scales graduated to ..... per cent	25
Table Speed		Number of indicated changes	24
		Range: Slow series ..... in. per min.	13 to 69
		Range: Fast series ..... in. per min.	36 to 181
Work Speed		Number of changes	24
		Range ..... r.p.m.	80 to 600
Countershaft		Tight and loose pulleys ..... diam., inches	16
		Belt width ..... inches	4½
		Speed ..... r.p.m.	450
Floor Space		Parallel to spindle ..... inches	122
		At right angles to spindle ..... inches	50
Weights (Approx.)		Net: Belt drive: Machine ..... lbs.	4450
		Net: Belt drive: Countershaft ..... lbs.	260
		Net: Fitted for motor ..... lbs.	4625
		Net: Fitted with motor ..... lbs.	4900
		Shipping: Belt drive (including countershaft) ..... lbs.	5200
		Shipping: Fitted for motor ..... lbs.	5150
		Shipping: Fitted with motor ..... lbs.	5400
Equipment	All machines	Coolant system, and everything shown in cuts.	
	Overhead drive machines	Countershaft.	
	Motor drive machines	Motor plate; belt; idler pulley and belt guard. (Motor, wiring and controlling equipment extra.)	

No. 30 Plain Grinding Machine (12″ x 18″)

Power Table and Cross Feeds



Capacity	Centers swing, diameter over table	12″	**Modified Machines**
	Centers take in length	18″	**No. 30A:** *Power Table Feed for Wheel Truing & Power Cross Feed.*
	Power required, depending upon grinding conditions	15-10 H.P.	**No. 30B:** *Hand Table & Cross Feeds.*

No. 30 Plain Grinding Machine (12″ x 18″)

			No. 30	No. 30A	No. 30B
Capacity	Centers swing	over table.....dia., in.	12	12	12
		with 24″ wheel. ...dia., in.	12	12	12
		with 30″ wheel. ...dia., in.	6	6	6
	Distance between centers...inches		18	18	18
Drives	Main drive shaft speed. ....r.p.m.		1000	1000	1000
	Wheel spindle	Belt width.....inches	8	8	8
		No. of changes of speed....	3	3	3
		Range.....r.p.m.	847, 1000, 1167	847, 1000, 1167	847, 1000, 1167
Wheels	Diameter.....inches		24 and 30	24 and 30	24 and 30
	Face	24″ wheel.....inches	2 to 10	2 to 10	2 to 10
		30″ wheel.....inches	2 to 6	2 to 6	2 to 6
Cross Feeds	With Table Traversing	Reduction in dia. of work at each table reversal.....	Automatic	Hand	Hand
		By quarter-thousandths from....inches	.00025 to .0045		
	With Table Stationary	Reduction in dia. of work per revolution of headstock.....	Automatic	Automatic	Hand
		By quarter-thousandths from....inches	.00025 to .0045	.00025 to .0045	
Swivel Table	Scales graduated to	.....degrees	9	9	9
		...in. of taper per ft.	4	4	4
		.....per cent	33	33	33
Table Speed	Number of changes.....		9	1	Hand*
	Range.....in. per min.		17 to 373	25	
Work Speed	Number of changes.....		6	6	6
	Range.....r.p.m.		42 to 270	42 to 270	42 to 270
Countershaft	Tight and loose pulleys .dia., inches		20	20	20
	Belt width.....inches		8	8	8
	Speed.....r.p.m.		400	400	400
Coolant	Capacity of tank.....gallons		45	45	45
Lubricant	Capacity of tank .....gallons		8	8	8
Floor Space	Parallel to spindle.....inches		85	85	85
	At right angles to spindle...inches		74	70	70
Weights (Approx.)	Net	Machine for overhead drive....lbs.	10,000	9,900	9,800
		Countershaft.....lbs.	725	725	725
		Machine fitted with motor.....lbs.	10,950	10,850	10,750
		Starting equipment.....lbs.	450	450	450
	Shipping	Machine for overhead drive....lbs.	11,300	11,200	11,100
		Countershaft.....lbs.	950	950	950
		Machine fitted with motor.....lbs.	12,500	12,100	12,300
		Starting Equipment.....lbs.	550	550	550
Equipment	All machines	Coolant pump; water guards; wheel lifting hook; 3 change pulleys for spindle speeds; and box containing set of dogs and wrenches.			
	Overhead drive mchs.	Countershaft. Grease gun for lubricating countershaft bearings. (Belt not furnished.)			
	Motor drive machines	Motor pulley; motor plate; ball bearing idler pulley with spring tension arrangement; and driving belt. (Motor, wiring and controlling equipment extra.)			

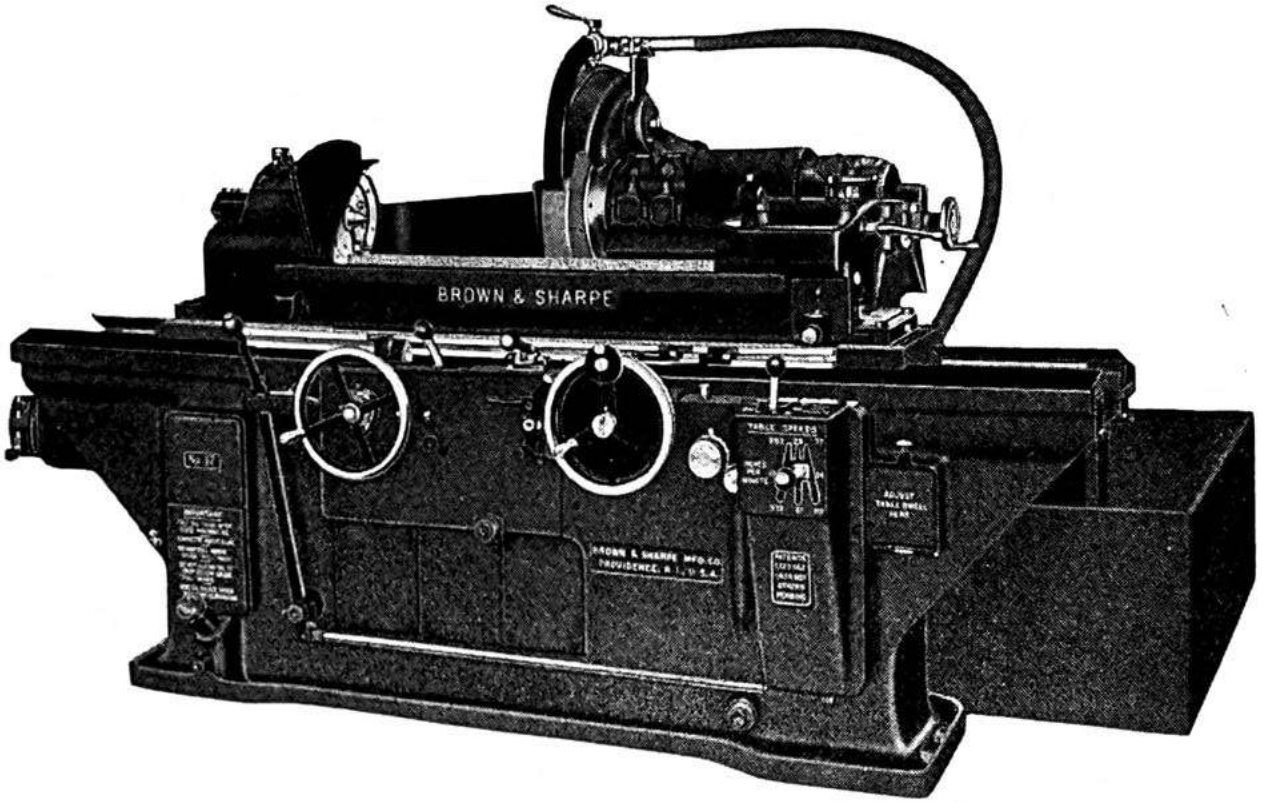
See page 124 for equipment not furnished with machine. *Fast and slow.

Furnished as Extra—

94 Gallon Coolant Tank can be furnished instead of 45 gallon tank when larger coolant capacity is desired and floor space of 76″ x 101″ is available.

No. 32 Plain Grinding Machine (14″ x 36″)

Power Table and Cross Feeds



Capacity	Centers swing, diameter over table. . . . Centers take in length. . . . . . Power required, depending upon grinding conditions	14″ 36″ 15–40 H.P.	***Modified Machines*** **No. 32A:** *Power Table Feed for Wheel Truing & Power Cross Feed.* **No. 32B:** *Hand Table & Cross Feeds.*

No. 32 Plain Grinding Machine (14″ x 36″)

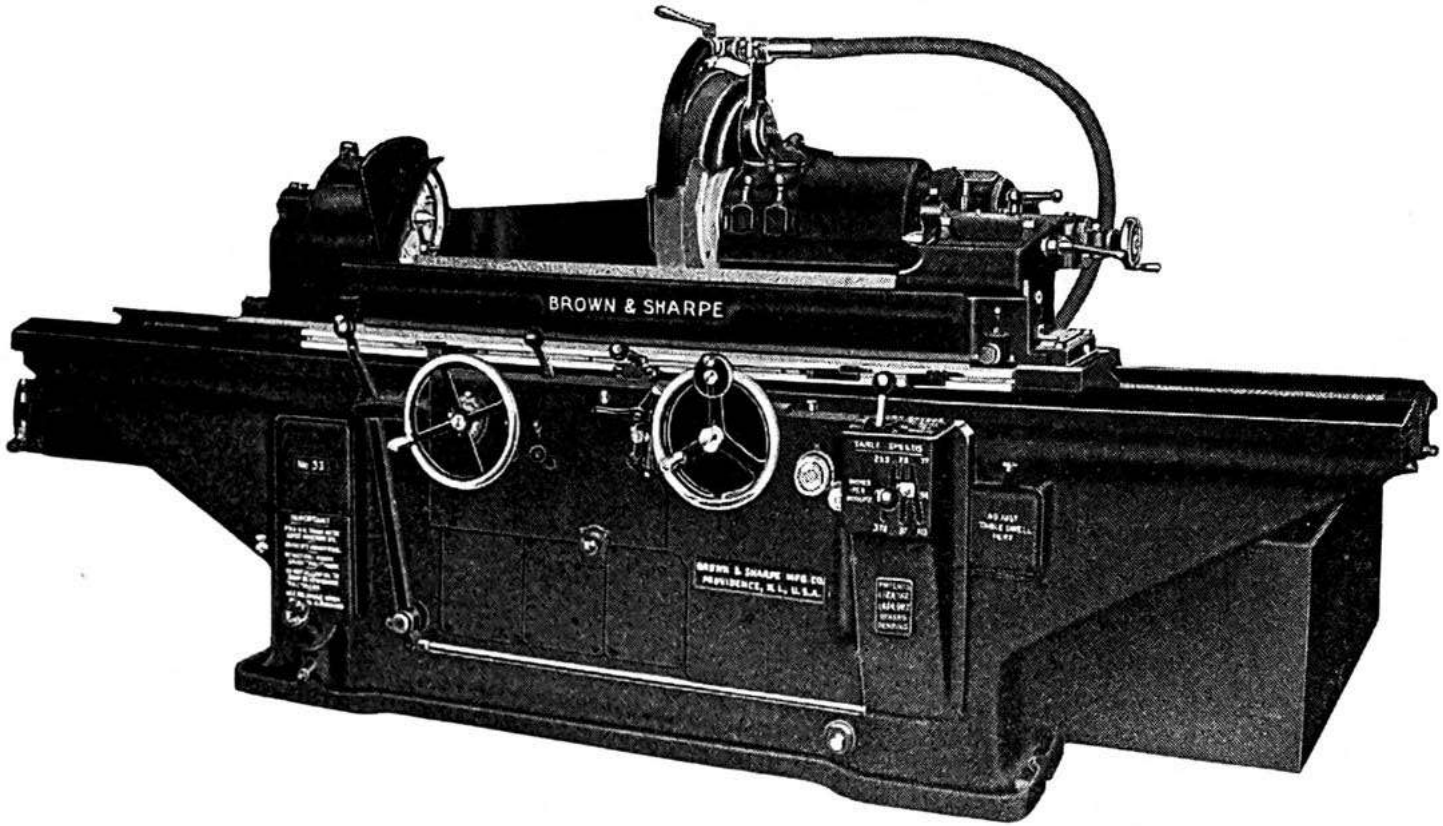
			No. 32	No. 32A	No. 32B
Capacity	Centers swing	over table . . . . . dia., in.	14	14	14
		with 24″ wheel. . . . dia., in.	12	12	12
		with 30″ wheel. . . . dia., in.	6	6	6
	Distance between centers . . . inches		36	36	36
Drives	Main drive shaft speed . . . . . r.p.m.		1000	1000	1000
	Wheel spindle	Belt width. . . . . inches	8	8	8
		No. of changes of speed. . .	3	3	3
		Range . . . . . r.p.m.	847, 1000, 1167	847, 1000, 1167	847, 1000, 1167
Wheels	Diameter . . . . . inches		24 and 30	24 and 30	24 and 30
	Face	24″ wheel . . . . . inches	2 to 10	2 to 10	2 to 10
		30″ wheel . . . . . inches	2 to 6	2 to 6	2 to 6
Cross Feeds	With Table Traversing	Reduction in dia. of work at each reversal	Automatic	Hand	Hand
		By quarter-thousandths from. . . . inches	.00025 to .0045		
	With Table Stationary	Reduction in dia. of work per revolution of headstock.	Automatic	Automatic	Hand
		By quarter-thousandths from. . . . inches	.00025 to .0045	.00025 to .0045	
Swivel Table	Scales graduated to	. . . . . degrees	7½	7½	7½
		in. of taper per ft.	3¼	3¼	3¼
		. . . . . per cent	27	27	27
Table Speed	Number of changes		9	1	Hand*
	Range . . . . . in. per min.		17 to 373	25	
Work Speed	Number of changes		6	6	6
	Range . . . . . r.p.m.		37 to 232	37 to 232	37 to 232
Countershaft	Tight and loose pulley, dia., inches		20	20	20
	Belt width . . . . . inches		8	8	8
	Speed . . . . . r.p.m.		400	400	400
Coolant	Capacity of tank . . . . . gallons		94	94	94
Lubricant	Capacity of tank . . . . . gallons		8	8	8
Floor Space	Parallel to spindle . . . . . inches		125	125	125
	At right angles to spindle. . . . inches		74	70	70
Weights (Approx.)	Net	Machine for overhead drive. . . . lbs.	10,900	10,800	10,700
		Countershaft . . . . . lbs.	725	725	725
		Machine fitted with motor . . . . . lbs.	12,000	11,900	11,800
		Starting equipment . . . . . lbs.	200	200	200
	Shipping	Machine for overhead drive. . . . lbs.	12,700	12,600	12,500
		Countershaft . . . . . lbs.	950	950	950
		Machine fitted with motor . . . . . lbs.	13,800	13,700	13,600
		Starting equipment . . . . . lbs.	265	265	265
Equipment	All machines	Coolant pump; water guards; wheel lifting hook; 3 change pulleys for spindle speeds; and box containing set of dogs and wrenches.			
	Overhead drive mchs.	Countershaft. Grease gun for lubricating countershaft bearings. (Belt not furnished.)			
	Motor drive machines	Motor pulley; motor plate; ball bearing idler pulley with spring tension arrangement; and driving belt. (Motor, wiring, and controlling equipment extra.)			

See page 124 for equipment not furnished with machine.

*Fast and slow.

No. 33 Plain Grinding Machine (14″ x 48″)

Power Table and Cross Feeds



Capacity	Centers swing, diameter over table . . . Centers take in length . . . . . . Power required, depending upon grinding conditions	14″ 48″ 15–10 H.P.	***Modified Machines*** **No. 33A:** *Power Table Feed for Wheel Truing & Power Cross Feed* **No. 33B:** *Hand Table & Cross Feeds.*

No. 33 Plain Grinding Machine (14″ x 48″)

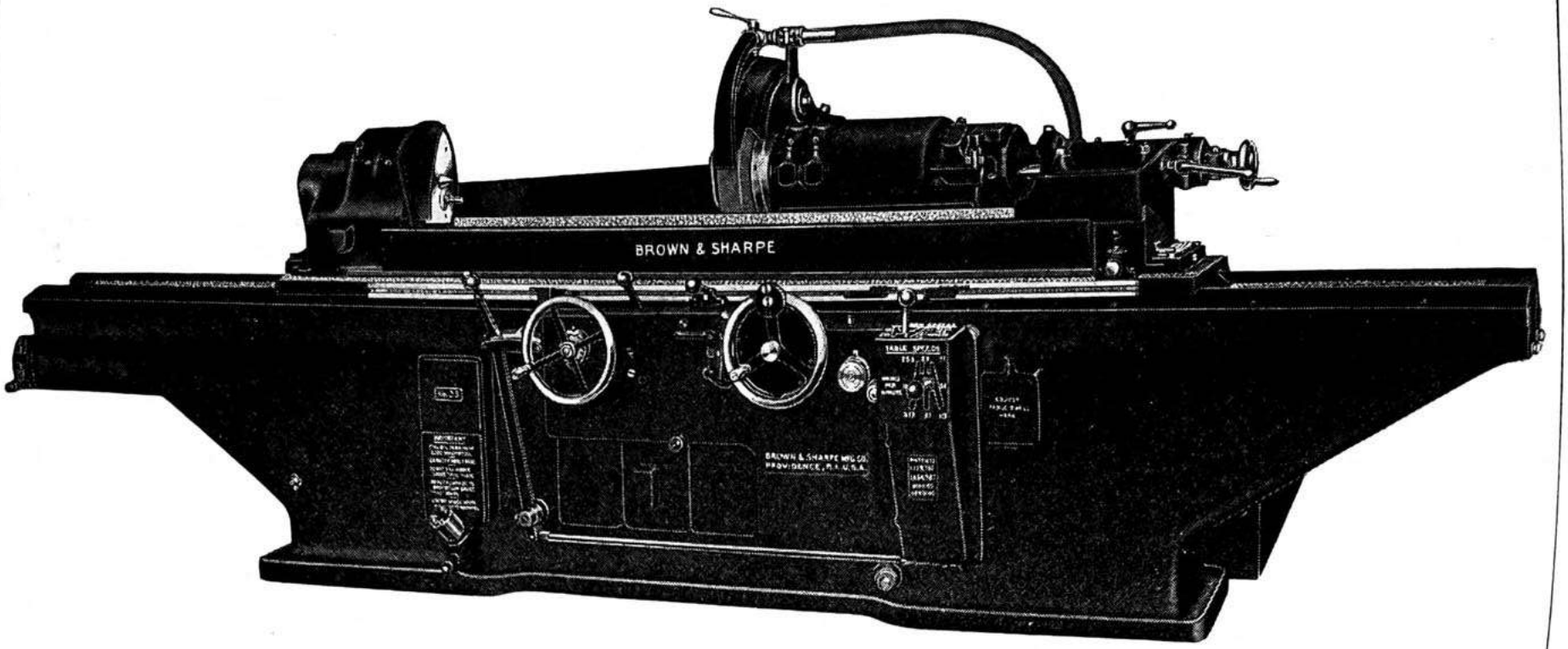
			No. 33	No. 33A	No. 33B
Capacity	Centers swing	over table . . . . . dia., in.	14	14	14
		with 24″ wheel . . . . dia., in.	12	12	12
		with 30″ wheel . . . . dia., in.	6	6	6
	Distance between centers . . . inches		48	48	48
Drives	Main driveshaft speed. . . . . r.p.m.		1000	1000	1000
	Wheel spindle	Belt width . . . . . inches	8	8	8
		No. of changes of speed. . .	3	3	3
		Range . . . . . r.p.m.	847, 1000, 1167	847, 1000, 1167	847, 1000, 1167
Wheels	Diameter . . . . . inches		24 and 30	24 and 30	24 and 30
	Face	. . . . . inches	2 to 10	2 to 10	2 to 10
		24″ wheel . . . . . inches	2 to 6	2 to 6	2 to 6
		30″ wheel . . . . . inches			
Cross Feeds	With Table Traversing	Reduction in dia. of work at each reversal	Automatic	Hand	Hand
		By quarter-thousandths from. . . . inches	.00025 to .0045		
	With Table Stationary	Reduction in dia. of work per revolution of headstock	Automatic	Automatic	Hand
		By quarter-thousandths from. . . . inches	.00025 to .0045	.00025 to .0045	
Swivel Table	Scales graduated to	. . . . . degrees	6½	6½	6½
		in. of taper per ft.	2¾	2¾	2¾
		. . . . . per cent	23	23	23
Table Speed	Number of changes		9	1	Hand*
	Range . . . . . in. per min.		17 to 373	25	
Work Speed	Number of changes		6	6	6
	Range . . . . . r.p.m.		37 to 232	37 to 232	37 to 232
Countershaft	Tight and loose pulleys . dia., inches		20	20	20
	Belt width . . . . . inches		8	8	8
	Speed . . . . . r.p.m.		400	400	400
Coolant	Capacity of tank . . . . . gallons		94	94	94
Lubricant	Capacity of tank . . . . . gallons		8	8	8
Floor Space	Parallel to spindle . . . . . inches		149	149	149
	At right angles to spindle. . . . inches		74	70	70
Weights (Approx.)	Net	Machine for overhead drive . . . . lbs.	11,450	11,350	11,250
		Countershaft . . . . . lbs.	725	725	725
		Machine fitted with motor . . . . . lbs.	12,450	12,350	12,250
		Starting equipment . . . . . lbs.	200	200	200
	Shipping	Machine for overhead drive . . . . lbs.	13,450	13,350	13,250
		Countershaft . . . . . lbs.	950	950	950
		Machine fitted with motor . . . . . lbs.	14,450	14,350	14,250
		Starting equipment . . . . . lbs.	265	265	265
Equipment	All machines	Coolant pump; water guards; wheel lifting hook; 3 change pulleys for spindle speeds; and box containing set of dogs and wrenches.			
	Overhead drive mchs.	Countershaft. Grease gun for lubricating countershaft bearings. (Belt not furnished.)			
	Motor drive machines	Motor pulley; motor plate; ball bearing idler pulley with spring tension arrangement; and driving belt. (Motor, wiring, and controlling equipment extra.)			

See page 124 for equipment not furnished with machine.

*Fast and slow.

No. 35 Plain Grinding Machine (14″ x 72″)

Power Table and Cross Feeds



Capacity	Centers swing, diameter over table. . . .	14″
	Centers take in length.	72″
	Power required, depending upon grinding conditions.	15–10 H.P.

No. 35 Plain Grinding Machine (14″ x 72″)

Capacity	Centers swing	over table . . . . . diam., inches	14
		with 24″ wheel . . . . . diam., inches	12
		with 30″ wheel . . . . . diam., inches	6
	Distance between centers . . . . . inches		72
Drives	Main driveshaft speed . . . . . r.p.m.		1000
	Wheel	Belt width . . . . . inches	8
		Number of changes of speed	3
	Spindle	Range . . . . . r.p.m.	817, 1000 and 1167
Wheels	Diameter . . . . . inches		24 and 30
	Face	24″ wheel . . . . . inches	2 to 10
		30″ wheel . . . . . inches	2 to 6
Cross Feeds	With Table Traversing	Automatic reduction in dia. of work at each reversal By quarter-thousandths from . . . . . inches	.00025 to .0015
	With Table Stationary	Automatic reduction in dia. of work per revolution of headstock By quarter-thousandths from . . . . . inches	.00025 to .0015
Swivel Table	Scales graduated to	. . . . . degrees	$4\frac{3}{4}$
		inches of taper per ft.	2
		. . . . . per cent	17
Table Speed	Number of changes		9
	Range . . . . . in. per min.		17 to 373
Work Speed	Number of changes		6
	Range . . . . . r.p.m.		37 to 232
Countershaft	Tight and loose pulleys . . . . . diam., inches		20
	Belt width . . . . . inches		8
	Speed . . . . . r.p.m.		400
Coolant	Capacity of tank . . . . . gallons		94
Lubricant	Capacity of tank . . . . . gallons		8
Floor Space	Parallel to spindle . . . . . inches		197
	At right angles to spindle . . . . . inches		74
Weights (Approx.)	Net	Machine for overhead drive . . . . . lbs.	13,200
		Countershaft . . . . . lbs	725
		Machine fitted with motor . . . . . lbs	14,200
		Starting equipment . . . . . lbs.	450
	Shipping	Machine for overhead drive . . . . . lbs.	15,750
		Countershaft . . . . . lbs.	950
		Machine fitted with motor . . . . . lbs.	16,900
		Starting equipment . . . . . lbs.	550
Equipment	All machines	Coolant pump; water guards; wheel lifting hook; 3 change pulleys for spindle speeds; and box containing set of dogs and wrenches.	
	Overhead drive machines	Countershaft. Grease gun for lubricating countershaft bearings. (Belt not furnished.)	
	Motor drive machines	Motor pulley; motor plate; ball bearing idler pulley with spring tension arrangement; and driving belt. (Motor, wiring, and controlling equipment extra.)	

See page 124 for equipment not furnished with machine.

Equipment and Attachments

For Use on Nos. 30, 32, 33 and 35 Plain Grinding Machines, Including A and B Types

Due to the variety of requirements of different customers, none of the following items are included with the machines unless ordered. This arrangement permits each customer to select the equipment best suited to his particular work.

Grinding Wheels

The machines use wheels with 12″ holes and standard 14¼″ recess. For our customers' convenience we maintain a small stock of 24″ and 30″ diameter wheels in a variety of widths of general purpose grade and grain. Equipment for using Straight Side Wheels can be furnished. Price on application.

Wheel Guards, Covers, and Coolant Nozzles

Furnished in sets. Wheel guard and cover of boiler plate. Designed to comply with safety code. Guard secured to wheel slide by heavy screws. Cover flanged to fit over edges of guard, held by screws. Coolant nozzle shaped to give smooth flow without splash, assures maximum cooling and grit removal.

No.	For Wheels Diam., Inches	Width of Wheel, Inches	Weights. complete	
			Net, Lbs.	Shipping, Lbs.
11	24	2 to 3	145	205
12		3 to 4	155	215
13		4 to 5	168	230
14		5 to 6	178	250
15		6 to 7	188	260
16		7 to 8	200	275
17		8 to 9	220	300
18		9 to 10	240	325
19	30	2 to 3	208	275
20		3 to 4	219	295
21		4 to 5	229	310
22		5 to 6	239	325

Equipment, (*Continued*)

Wheel Sleeves

Cast iron sleeve and flange, with adjustable segments for balancing. Tapered and keyed to fit spindle end. Take wheels with 12″ hole and standard recess. Wrench furnished.

No. of Wheel Sleeve	For Wheels of the following Widths, Inches	Weights	
		Net, Lbs.	Shipping, Lbs.
11	2 to 2 31/32	65	80
12	3 to 6	100	120
13	6 to 10	140	165

Grinding Wheel Balancing Arbors

Arbor tapered to fit wheel sleeves and held in place by knurled check nut without use of tools. Arbor case hardened and ground.

No. of Arbor	For Wheel Sleeves Nos.	Distance required between Knife Edges of Balancing Ways		Weights	
		Max., Inches	Min., Inches	Net, Lbs.	Shipping, Lbs.
1	11 and 12	10	8½	19	25
2	13	14	12½	25	33

Balancing Ways

Nos. 1 and 2, for use with Nos. 1 and 2 Arbors for balancing grinding wheels. Will take wheels to 30″ diameter, 6″ face. Weights. Net, 50 lbs. Shipping, 65 lbs.

Center Grinding Attachment

Easily attached and removed. Operated by handwheel. Trues centers at 60°. Weights. Net, 29 lbs. Shipping, 40 lbs.

Single-Shoe Back Rest

Solid type. Affords exceptional rigidity to work on straight-in-feeds. Positively adjusted. Shoe holders and shoes available in different sizes. Weights. Net, 34 lbs. Shipping, 48 lbs.

Double-Shoe Back Rest

Solid type. Designed primarily for grinding with table traversing. Easily attached and removed. Shoes of cast iron. Narrow to afford support between shoulders. Shoes adjusted individually and positively. Furnished with 5 shoes to cover range of ½″ to 5″ diameter. Weights. Net, 31½ lbs. Shipping, 40 lbs.

Equipment, (*Continued*)

Spring Back Rest

For supporting slender shafts when grinding with traversing table. Easily attached and removed. Adjustable positive stops facilitate duplication of size.

Weights. Net, 19 lbs. Shipping, 25 lbs.

Diamond Tool Holder (Footstock Type)

Held in position by clamp on footstock. Brace, resting on center, assures rigidity. Diamond not included.

Weights. Net, 5 lbs. Shipping, 8 lbs.

Diamond Tool Holder (Table Type)

Easily attached and removed from table. Clamped by lever. Of light but rigid construction. Diamond not included.

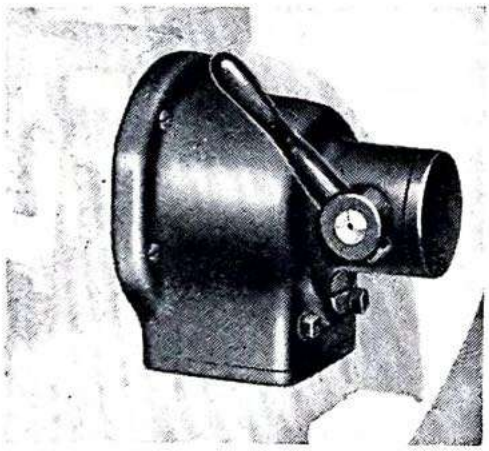
Weights. Net, 14½ lbs. Shipping, 22 lbs.

Center Rest

Easily attached and removed. Takes work from ½″ to 3″ diameter.

Weights. Net, 26½ lbs. Shipping, 37 lbs.

Spindle Reciprocating Attachment



Easily applied. Provides ⅛″ movement of wheel spindle at 20 to 32 reciprocations per minute, depending upon spindle speed. Operated from spindle through heat-treated alloy steel gears. Has end thrust bearing. Mechanism completely enclosed and automatically lubricated. Attachment made non-operative by convenient lever.

Weights. Net, 51 lbs. Shipping, 65 lbs.

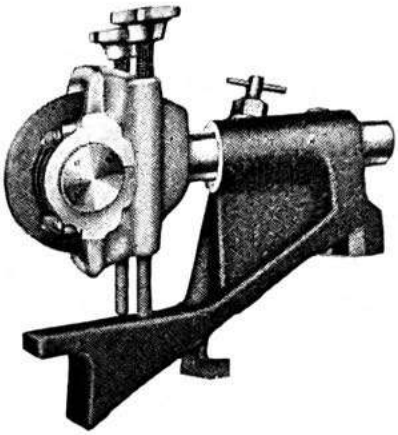
Revolving Spindle Headstock

Clamps to machine table and is driven from regular work driving plate.

Weights. Net, 140 lbs. Shipping, 170 lbs.

Equipment, (*Continued*)

No. 1 R.S. Grinding Wheel Truing Tool

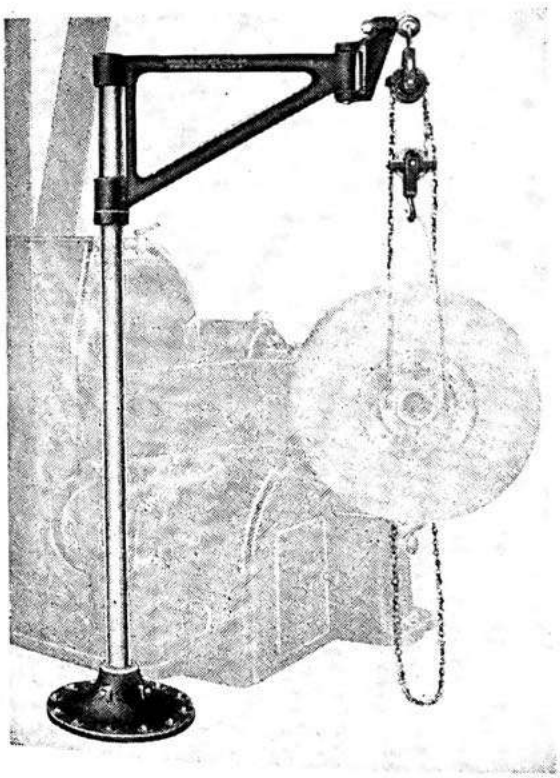


No. 1 R.S. Grinding Wheel Truing Tool dresses the wheel with a finish comparable to that obtained with a diamond and at a lower cost. Two adjustable steady rests permit the tilting of the dressing wheel to any shearing angle. Wheel furnished, 5″ diameter, 1¼″ face, 2¼″ hole.

Weights: Net, 28½ lbs. Shipping, 44 lbs.

Set of Tools for Servicing can be furnished at extra cost.

Grinding Wheel Hoist



The Grinding Wheel Hoist greatly simplifies the operation of changing wheels and is also useful in handling the wheel guards and other heavy parts. It consists of a vertical column mounted on a large diameter base securely bolted to the floor at the rear of the machine. A swinging beam and swivel carrying a ¼ ton chain fall is mounted on the vertical column. The complete arrangement can be included within the floor space limits of the machine.

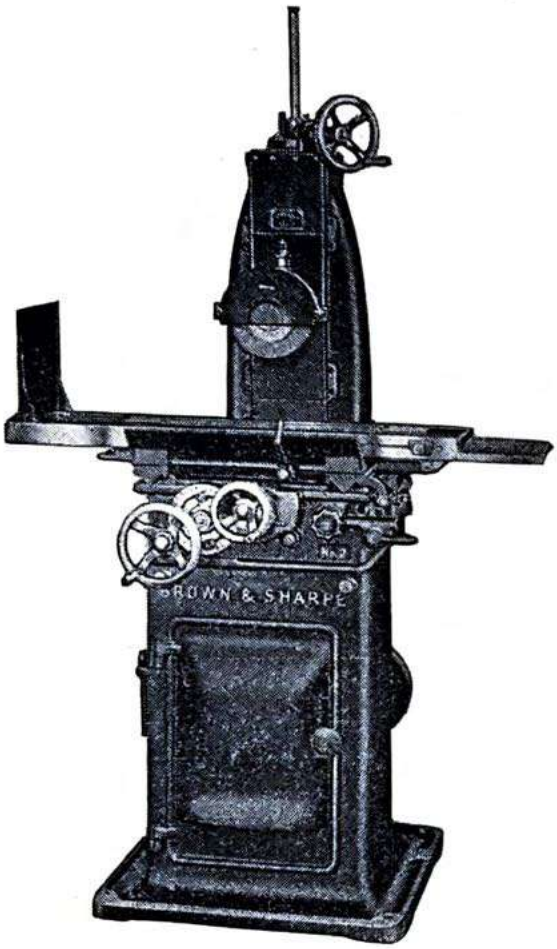
Height: 89½″. Base: Diameter, 19″.

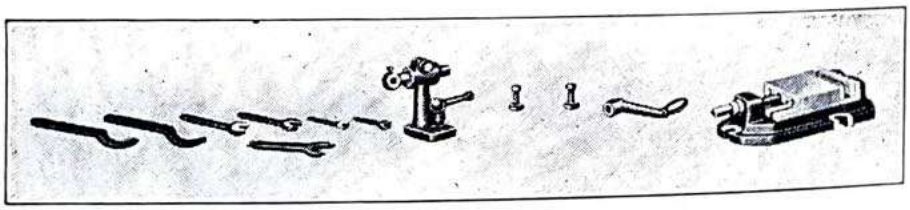
Weights. Net, 425 lbs. Shipping, 575 lbs.

No. 2 Surface Grinding Machine

No. 2B Surface Grinding Machine

With Hand Feeds Only





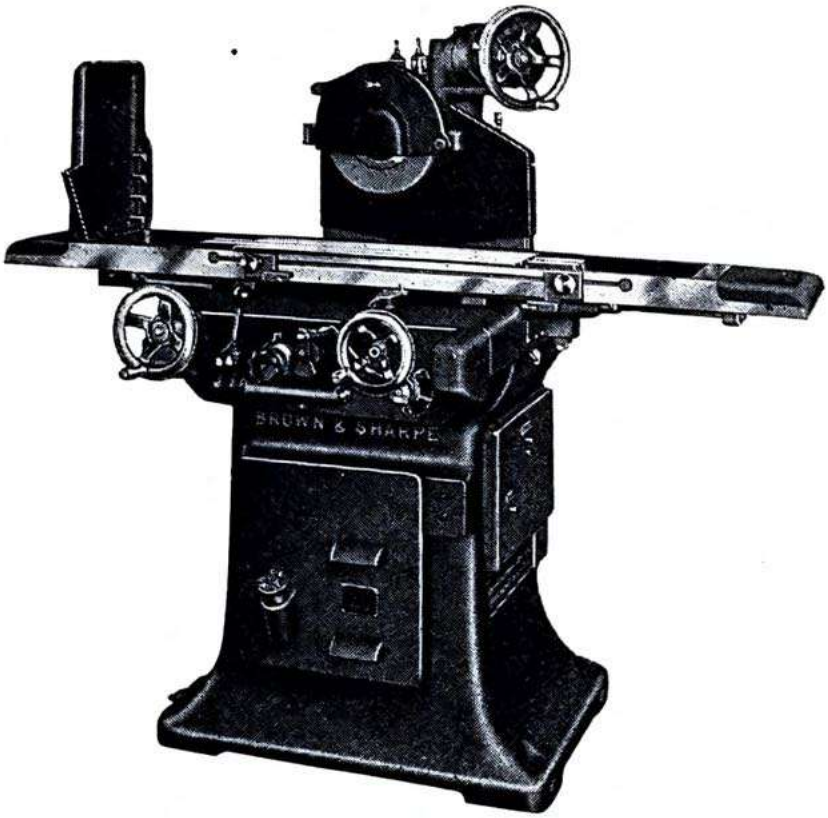
No. 2 shown

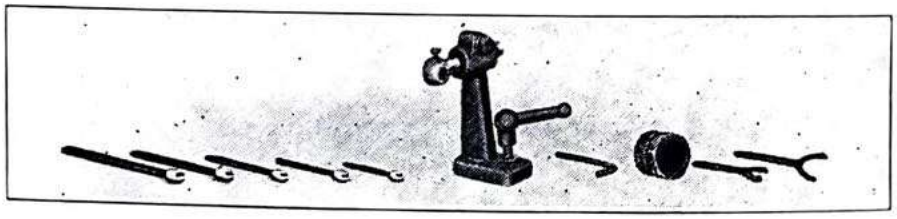
		No. 2	No. 2B
Capacity	Longitudinal feed, automatic	18	18"
	Longitudinal travel, hand		
	Transverse feed, automatic at reversal of table	6"	6"
	Transverse movement		
	Grinds work (using a 7" diameter wheel) to height of	9½"	9½"
	Power required	1½ H.P.	1½ H.P.

No. 2 Surface Grinding Machine
No. 2B Surface Grinding Machine (With Hand Feeds Only)

		No. 2	No. 2B
Capacity (Work that can be ground)	Length . . . . . inches	18	18
	Width . . . . . inches	6	6
	Height (using 7″ wheel) . . . . . inches	9½	9½
Wheel Spindle	Takes wheels to Diameter . . . . . inches	7	7
	Takes wheels to Thickness . . . . . inches	½	½
	Speed . . . . . r.p.m.	3200	3200
Wheel Spindle Slide	Vertical adjustment . . . . . inches	11	11
	Handwheel graduated to half-thousandths		
Table	Length . . . . . inches	46	46
	Width . . . . . inches	8	8
	Working surface . . . . . inches	18 x 6	18 x 6
	T-slots Number	3	3
	T-slots Width . . . . . inches	½	½
	Travel Longitudinal . . . . . inches	18 Auto.	18 Hand
	Travel Speed . . . . . Ft. per min.	33	
Cross Feed	In either direction at each reversal of table . . . . . inches	.01 to .09 Auto.	Hand
	Total adjustment . . . . . inches	6	6
Vise	Flanged . . . . . Capacity (Width, Depth Opens) inches	4⅛ x 1 1/16 x 2	
Countershaft	Tight and loose pulleys . . diam., inches	8	8
	Belt width . . . . . inches	3	3
	Speed . . . . . r.p.m.	360	360
Floor Space	At right angles to spindle . . . . . inches	65	65
	Parallel to spindle . . . . . inches	31	31
Weights (Approx.)	Net, Belt drive, Machine . . . . . lbs.	1225	1175
	Net, Belt drive, Countershaft . . . . lbs.	150	150
	Net, Fitted for motor . . . . . lbs.	1250	1200
	Net, Fitted with motor . . . . . lbs.	1350	1300
	Shipping, Belt drive (including countershaft) . . . . . lbs.	1700	1650
	Shipping, Fitted for motor . . . . . lbs.	1575	1525
	Shipping, Fitted with motor . . . . . lbs.	1675	1625
Equipment	All machines	Everything shown in cuts.	
	Overhead drive machines	Countershaft.	
	Motor drive machines	Motor plate, belt and weighted idler pulley. (Motor, wiring and controlling equipment extra.)	

No. 5
Surface Grinding Machine
Hydraulic Type





Capacity	Longitudinal hydraulic feed, automatic	24″
	Transverse hydraulic feed, automatic at reversal of table	8″
	Grinds work (using a 10″ diameter wheel) to height of	11″
	Power required	2¼ H.P.

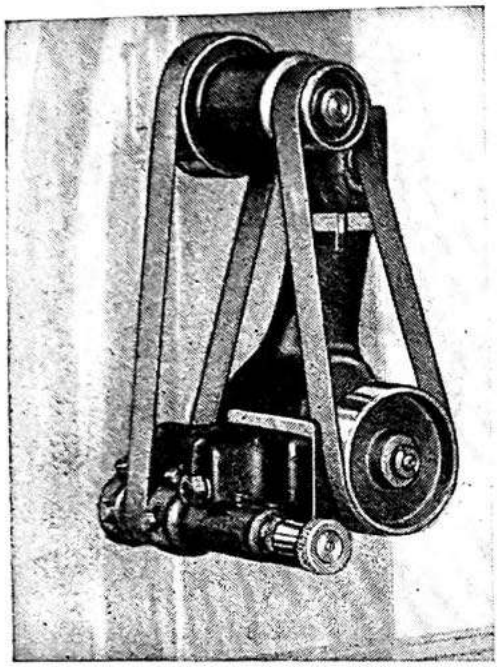
No. 5 Surface Grinding Machine

Capacity (Work that can be ground)	Length . . . . . inches	24
	Width . . . . . inches	8
	Height (using 10″ wheel) . . . . . inches	11
Wheel Spindle Unit	Cartridge type. Driven by belt from 1½ H.P. motor on lower end of wheel spindle slide.	
	Spindle { Takes wheels to { Diameter . . . . . inches	10
	Thickness . . . . . inches	¾
	Hole . . . . . diam., inches	3
	Speed . . . . . r.p.m.	2300
Wheel Spindle Slide	Vertical adjustment . . . . . inches	12
	Graduated handwheel provides two ratios: .0005″ per graduation for quick movements; .0001″ per graduation for fine settings	
Table	Length . . . . . inches	67
	Width . . . . . inches	11¾
	Working surface . . . . . inches	24 x 8
	T-slots { Number	3
	Width . . . . . inches	9/16
	Feeds, automatic — Longitudinal: Travel . . . . . inches	24
	Speed . . . . . ft. per min.	0 to 60
	Changes of speed	Any desired
	Feeds, automatic — Transverse: In either direction at each reversal of table . . . . . inches	0 to .15
	Changes of feed	Any desired
	Wheel truing . . . . . in. per min.	12
	Total adjustment . . . . . inches	8
Hydraulic System	Pump (direct connected to ¾ H.P. motor), oil reservoir, and automatic pressure control unit in base of machine. Oil filter provided. Pump positively primed. Feed control valves and adjustments located in compartment in carriage. Driving pistons require no packing.	
Floor Space	At right angles to spindle . . . . . inches	95
	Parallel to spindle . . . . . inches	48
Weights (Approx.)	Net { Fitted for spindle driving motor . . . . . lbs.	1965
	With motor . . . . . lbs.	2075
	Shipping { Fitted for spindle driving motor . . . . . lbs.	2415
	With motor . . . . . lbs.	2525
Equipment	Hydraulic pump driving motor, and everything else shown in cuts.	

Due to the built-in construction, this machine is *always* furnished equipped with hydraulic pump driving motor.

High Speed Surface Grinding Attachment

For Nos. 2 and 2B Surface Grinding Machines



This attachment drives small grinding wheels at a high rate of speed and is readily applied to the machine. Slots and small surfaces which do not permit the use of a wheel of large diameter can be rapidly and economically ground with the attachment.

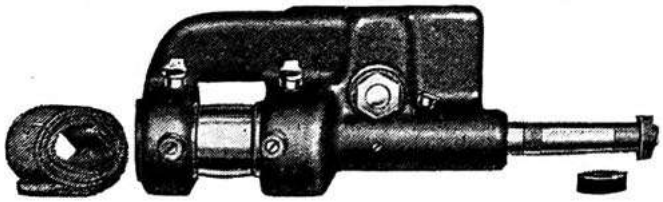
The drive is taken by means of a canvas belt, from a pulley mounted on the wheel spindle of the machine, to a pulley on the front end of a short countershaft. A second canvas belt transmits the drive from a larger pulley on the rear end of the countershaft to the grinding head.

A No. 3 High Speed Surface Grinding Head is furnished with the attachment but a No. 1 or a No. 4 Grinding Head, each of a different capacity and speed, may be substituted without extra charge. See table below for specifications.

Weights. Net, 37 lbs. Shipping, 47 lbs.

High Speed Surface Grinding Heads

For Use on the High Speed Surface Grinding Attachment

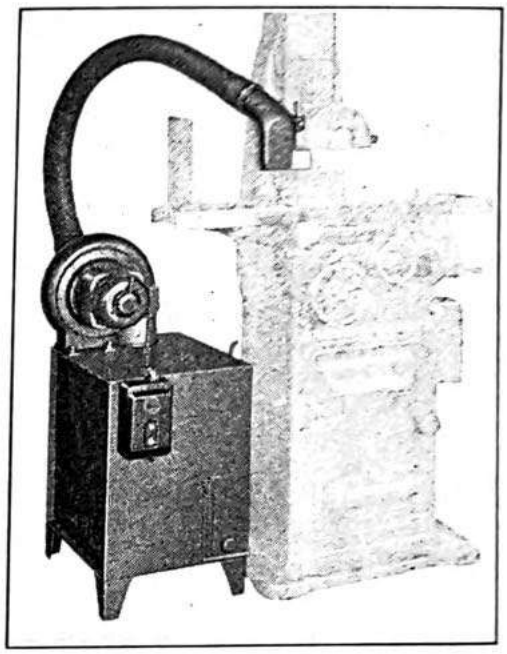


No. of Grinding Head	Diameters of grinding wheels furnished, In.	Width of Face of grinding wheels furnished, In.	Distance: Rear Face of grinding wheel to End of Wheel Spindle of Machine, Inches	Spindle Speed R. P. M.
1	3/8, 1/2	1/4	3/4, 1 1/8 and 1 1/2 (3 arbors furnished)	22500
*3	7/8	1/4	1 7/8	15700
4	1 1/4	3/8	1 7/8	15000

*No. 3 Grinding Head furnished with High Speed Surface Grinding Attachment unless otherwise specified.

Exhaust Arrangement

For Nos. 2, 2B and *5 Surface Grinding Machines



This Motor Driven Exhaust Arrangement is adaptable to both motor and overhead drive machines. The flexible pipe carries the dust from the nozzle attached to the wheel guard, to the exhauster which is mounted on the separator tank and driven by a flanged type motor of one-third horsepower. An overload start-stop switch is provided for the exhauster motor.

The exhauster discharges into the separator compartment where the air and dust are driven through the spiral centrifugal separator, throwing the dust into the dust compartment by centrifugal force. The cleaned air passes into the expansion compartment and finally is discharged through a renewable, viscous coated, split-wire filter.

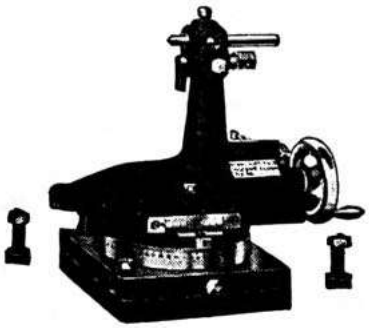
The capacity of the exhauster is 300 cu. ft. per minute, giving a velocity of approximately 6000 ft. per minute through the 3″ diameter suction hose which is made of a spiral wire imbedded in rubber with a fabric covering. The floor space required is no more than that necessary for the longitudinal movement of the table, although approximately 14″ should be allowed behind the machine for the loop in the flexible suction hose.

Weights. Net, 200 lbs. Shipping, 275 lbs.

*Attachment for No. 5 Machine is similar to the above.

Radius and Angular Wheel Truing Attachment

For Nos. 2, 2B and 5 Surface Grinding Machines



With this attachment both convex and concave wheel outlines having radii varying from 0 to 1 inch and face angles up to 90° either side of zero can be formed. Also with its use, numerous combinations of radial and angular shapes otherwise difficult to obtain can easily be developed.

The slide has a scale graduated to 1″ either side of zero by 64ths. The swivel base is graduated either side of zero to 90° by degrees.

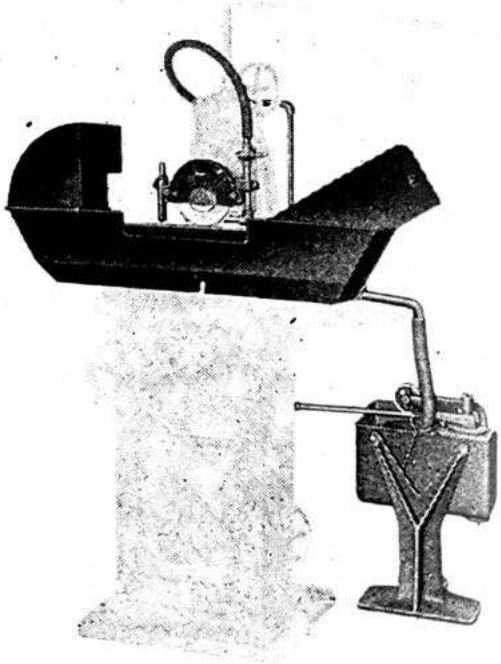
Auxiliary base is furnished for use with magnetic chuck.

Weights. Net, 33 lbs. Shipping, 42 lbs.

Diamond for diamond tool can be furnished as extra.

Wet Grinding Attachment

For Nos. 2, 2B and *5 Surface Grinding Machines



This attachment is constructed of strong, durable material and, when mounted in place, requires but little more space than is ordinarily needed for the machine.

Water is supplied to the wheel, which has a special splash guard, by a centrifugal pump immersed in a supply tank. The tank is supported from the floor by a rugged bracket. The water is caught in the work tank, which is provided with a large, heavily japanned hood and splash guards, and is returned to a settling pan in the pump tank through a flexible discharge pipe.

For motor driven machines this attachment is furnished in slightly altered form. A ¼ H.P. motor is required to drive it and a motor bracket and pulley are furnished.

Weights. Net, 285 lbs. Shipping, 415 lbs.

*Attachment for No. 5 Machine differs somewhat from that for Nos. 2 and 2B Machines described above.

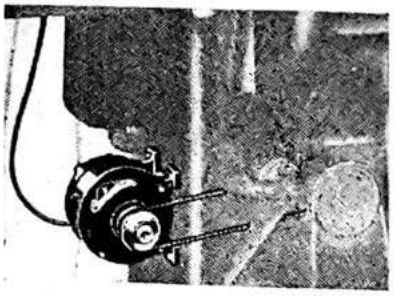
Magnetic Chucks

For Nos. 2, 2B and 5 Surface Grinding Machines

These chucks are found very convenient, especially when grinding small, flat pieces.

Circular giving detailed information and prices mailed upon request.

Magnetic Chuck Generator



For Nos. 2, 2B and *5 Surface Grinding Machines

This equipment furnishes current for a magnetic chuck when direct current is not otherwise available.

On motor driven Nos. 2 and 2B Machines, the generator is attached to the side of the machine and driven from the main motor through a Vee belt.

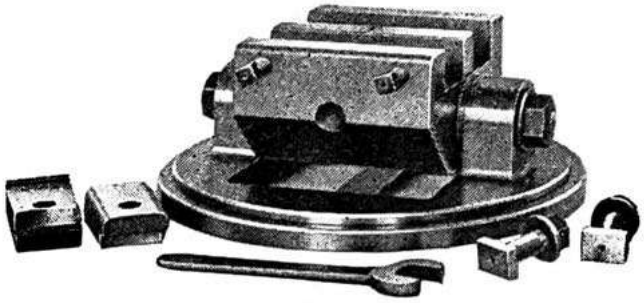
For belt driven machines, the generator is usually mounted on a wall or ceiling where it may be driven conveniently from shafting.

Weights. Net, 29 lbs. Shipping, 35 lbs.

*Magnetic Chuck Generator for No. 5 Machine differs from that for Nos. 2 and 2B Machines described above.

Adjustable Swivel Vise

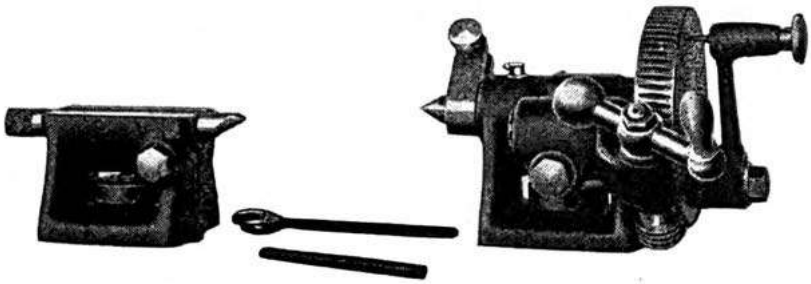
For Nos. 2, 2B and 5 Surface Grinding Machines



This is a very convenient vise for holding many jobs ordinarily performed on surface grinding machines. See page 605.

4¾ Inch Index Centers

For Nos. 2, 2B and 5 Surface Grinding Machines



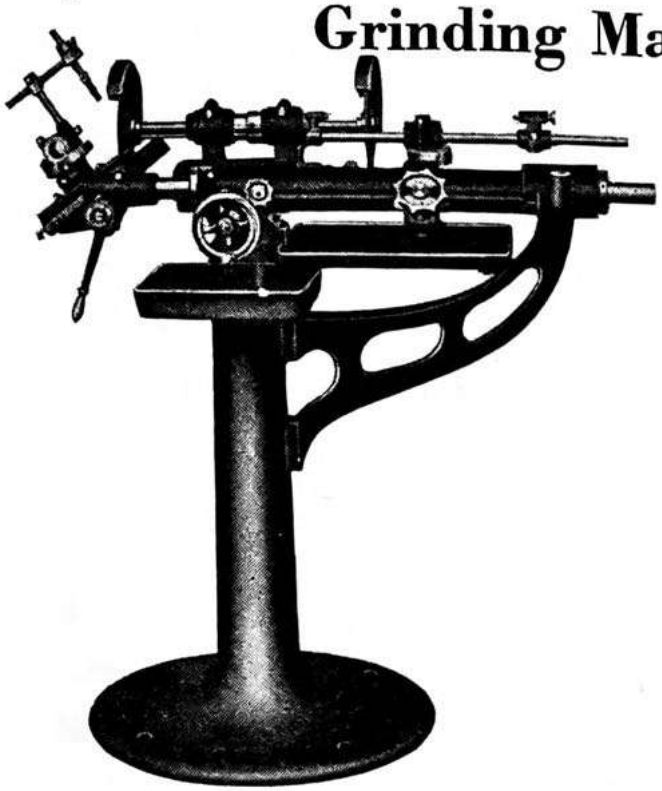
These index centers conveniently obtain exact spacing of the more common numbers of divisions upon the periphery of the work when grinding taps, reamers, formed cutters and work of a similar class. They are easily attached to the machine by means of lugs which fit into the T-slots of the table. Indexing is rapid and accurate.

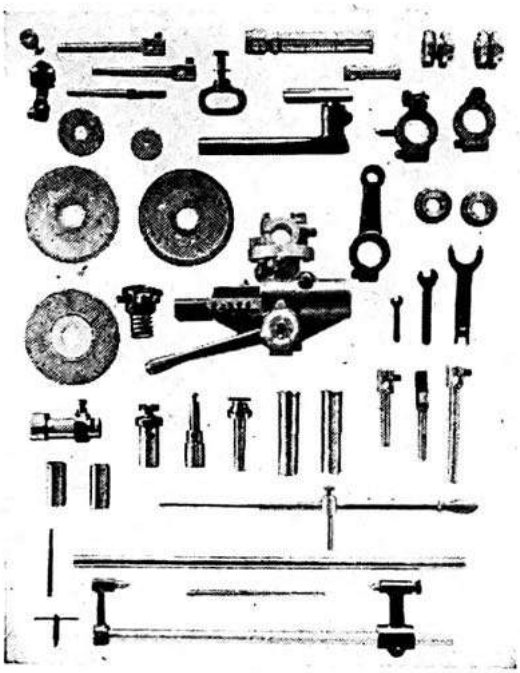
Index wormwheel having six rows of holes of 18, 20, 22, 24, 26 and 28 holes respectively, can be turned by worm, or worm can be thrown out of mesh and wheel turned by hand. Ratio of worm to wormwheel, 75:1.

Centers swing 4¾″ diameter. Combined length of head and footstock, 8½″. Raising blocks can be used to increase swing if desired.

Weights. Net, 13 lbs. Shipping, 18 lbs.

No. 3 Universal Cutter and Reamer Grinding Machine





Equipment Furnished: Tooth gage holder support collar; center finger support; tooth rest holder joint (horizontal); tooth rest swivel; tooth rest holder (side); tool rest slide bolt; 2 sliding shells; wheel sleeves; tool rest and slide; main bar adjusting stop; main bar stop; 5 grinding wheels; mill bushing sleeve and spring; end grinding head (complete); large cutter bar arm; 2 sliding shell step collars; 5 wrenches; thread tool holder (furnished when ordered and at extra cost); 2 swivel head bushings; 2 wheel arbors; straddle mill arbor; 2 taper-shank mill bushings; 3 tooth rest joints; slide bar lever link; slide bar lever stud; slide bar lever; 2 cutter bars; center bar.

Capacity	Takes between centers	18″
	Cutters and shell reamers to diameter	6″
	Cutters and shell reamers to length	7″
	Power required	¾ H.P.

No. 3 Universal Cutter and Reamer Grinding Machine

Capacity	Grinds work in length between centers	inches	18
	Grinds cutters and shell reamers to — Length	inches	7
	Grinds cutters and shell reamers to — Diameter	inches	6
Wheel	Longitudinal adjustment	inches	6
Spindle	Speed — Number of changes		2
	Speed — Range	r.p.m.	2702 and 3375
	Belt width	inches	1
Countershaft	Tight and loose pulleys	diam., inches	6
	Speed	r.p.m.	375
	Belt width	inches	2
Floor Space	Overhead drive — At right angles to spindle	inches	33
	Overhead drive — Parallel to spindle	inches	58
	Motor drive — At right angles to spindle	inches	36¼
	Motor drive — Parallel to spindle	inches	58
Weights (Approx.)	Net — Belt drive — Machine	lbs.	435
	Net — Belt drive — Countershaft	lbs.	115
	Net — Fitted for motor	lbs.	549
	Net — Fitted with motor	lbs.	625
	Shipping — Belt drive (including countershaft)	lbs.	785
	Shipping — Fitted for motor	lbs.	725
	Shipping — Fitted with motor	lbs.	815
Equipment	All machines	Everything shown in cuts.	
	Overhead drive machines	Countershaft.	
	Motor drive machines	Motor pulley, motor plate, weighted idler pulley and driving belt. (Motor, wiring and controlling equipment extra.)	

Formed Cutter Grinding Attachment

For No. 3 Universal Cutter and Reamer Grinding Machine

This attachment is used for grinding radially the teeth of formed cutters. This method is necessary in order to secure the correct cutting form. The device consists of a bed, rigidly attached to the main bar, carrying a sliding table provided with a pair of index centers mounting the work to be ground.

Centers swing 4¾″ in diameter and take 10½″ in length.

The index wormwheel has six rows of holes of 18, 20, 22, 24, 26 and 28 holes respectively and can be turned by a worm or the worm can be disengaged and the plate turned by hand.

Weights. Net, 76 lbs. Shipping, 104 lbs.

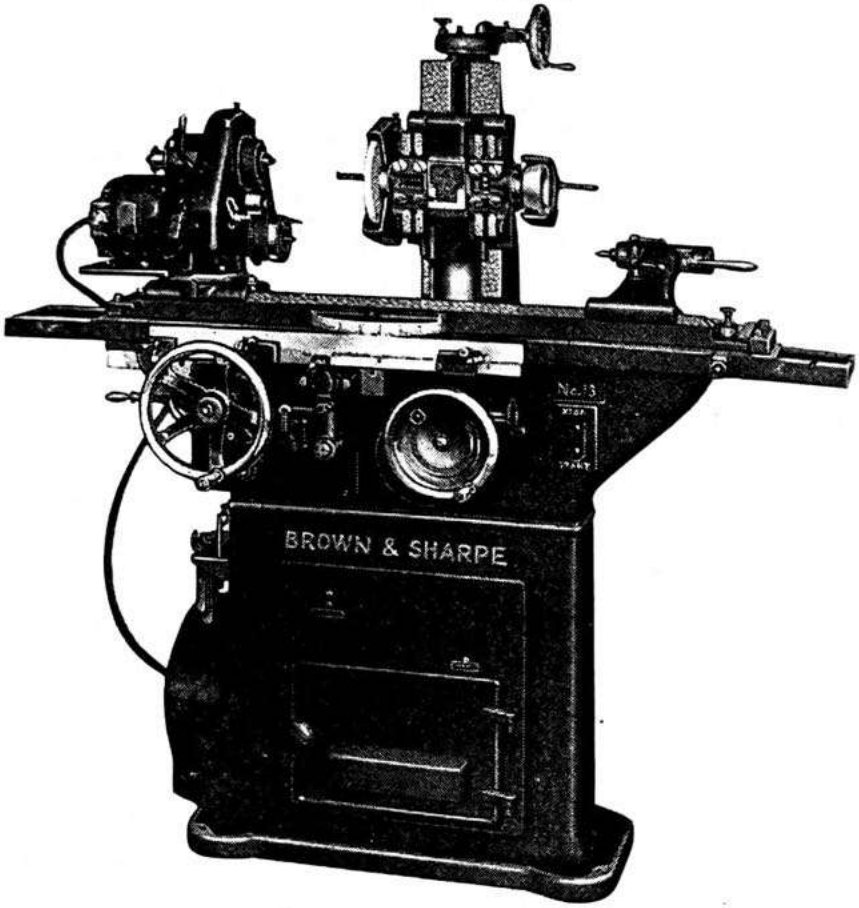
Raising Blocks to permit the attachment to swing 8 inches diameter can be furnished as extra.

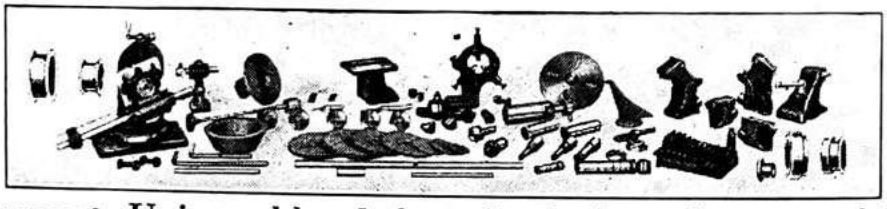
Bushings

For No. 3 Universal Cutter and Reamer Grinding Machine

Bushings for Nos. 10, 20 or 30 Milling Machine Standard taper shanks can be furnished.

No. 13
Universal and Tool Grinding Machine
Motor Driven





Equipment: Universal head; face chuck; face plate; set of dogs; center height gage; cutter bar with sliding shell and set of collars; cutter bar with bushing for universal head and sliding shell, with set of collars; arbor for straddle and face mills and 3 collars; 2 taper shank mill bushings; 4 tooth rests and holders; 3 centers, including reamer grinding center; center rest; tool rest; diamond tool bracket; 5 headstock speed change pulleys; 3 wheel spindle change pulleys; 4 wheel arbors; 7 wheel sleeves; 11 grinding wheels; 3 plain and 3 adjustable wheel guards, and everything else shown in cuts.

Capacity	Centers swing in diameter	8″
	Centers take in length	24″
	Longitudinal table feed, automatic	15″
	Power required	1¾ H.P.

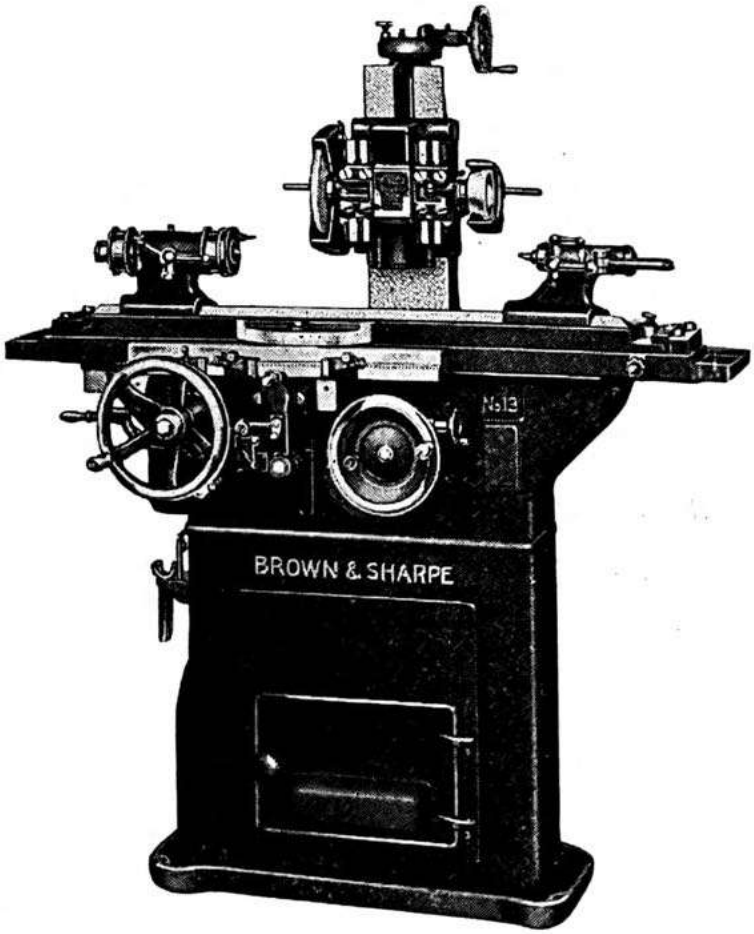
No. 13 Universal and Tool Grinding Machine

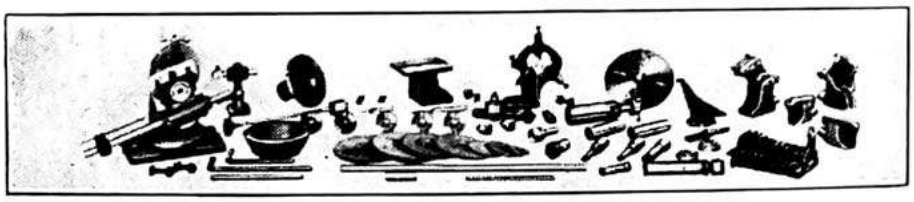
Motor Driven

Capacity	Centers swing ..... diam., inches	8
	Center of wheel spindle to top of table { Max. ..... inches	12⅛
	Center of wheel spindle to top of table { Min. ..... inches	4⅛
	Distance between centers ..... inches	24
	Automatic table travel ..... inches	15
Spindle Slide Upright	Transverse movement ..... inches	10½
	Swivel base graduated to read either side of zero to ..... degrees	90
	Handwheel graduated to read to thousandths.	
Wheel Spindle Slide	Vertical adjustment ..... inches	8
	Handwheel graduated to read to half thousandths.	
Wheel Spindle	Belt width ..... inches	1¼
	Spindle Speed { Number of changes	3
	Spindle Speed { Range ..... r.p.m.	2455, 3545, 5730
	Takes Wheels { Diameter ..... inches	1 to 7
	Takes Wheels { Thickness (straight wheels) ..... inches	¼ to ½
	Takes Wheels { Width (cupped wheels) ..... inches	1½ and 2
Swivel Table	T-slots { Number	1
	T-slots { Width ..... inches	½
	Swivels either side of zero to ..... degrees	90
	Swivel scale reads to degrees.	
	Scale on end reads to ..... inches of taper per ft.	3
Center Rest	Takes work to ..... diam., inches	2
Table Speed	Number of changes	4
	Range for any work speed ..... In. per min.	12 to 84
Headstock	Front end threaded	6 R.H., Ntl. Std.
	Front end diameter ..... inches	1½
	Taper hole ..... No.	6
	Swivel base scale graduated to degrees.	
Work Speed	Number of changes	3
	Range ..... r.p.m.	120 to 530
Universal Head	Vertical adjustment ..... inches	4
	Can be set to any angle in vertical and horizontal planes either side of zero, to ..... degrees	90
	Swing over table ..... diam., inches	16
	With head at right angles to table, takes light work to ..... diam., inches	24
Floor Space	Parallel to spindle ..... inches	84
	At right angles to spindle ..... inches	45
Weights (Approx.)	Fitted with motor { Net ..... lbs.	2450
	Fitted with motor { Shipping ..... lbs.	2950
Equipment	Everything shown in cuts together with two constant speed motors, controlling equipment and wiring complete.	

This machine is *only* furnished fitted with motors mounted at our plant.

No. 13
Universal and Tool Grinding Machine





Equipment: Universal head; face chuck; face plate; set of dogs; center height gage; cutter bar with sliding shell and set of collars; cutter bar with bushing for universal head and sliding shell, with set of collars; arbor for straddle and face mills and 3 collars; 2 taper shank mill bushings; 4 tooth rests and holders; 3 centers, including reamer grinding center; center rest; tool rest; diamond tool bracket; 4 wheel arbors; 7 wheel sleeves; 11 grinding wheels; 3 plain and 3 adjustable wheel guards and everything else shown in cuts.

Capacity	Centers swing in diameter	8″
	Centers take in length	24″
	Maximum longitudinal table feed, automatic	22″
	Power required	2 H.P.

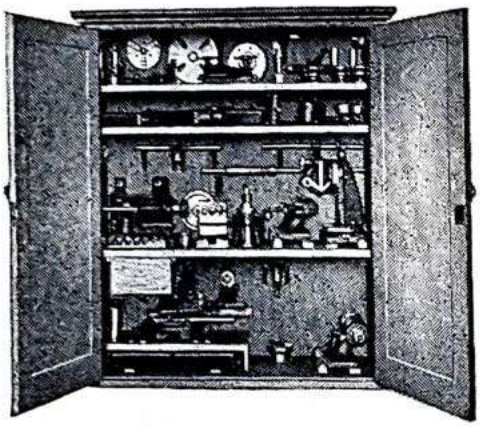
No. 13 Universal and Tool Grinding Machine

Capacity	Centers swing . . . . . diam., inches	8
	Center of wheel spindle to top of table { Max. . . . . inches	12⅛
	Center of wheel spindle to top of table { Min. . . . . inches	4⅛
	Distance between centers . . . . . inches	24
	Automatic table travel, Maximum . . . . . inches	22*
Spindle Slide Upright	Transverse movement . . . . . inches	10½
	Swivel base graduated to read either side of zero to . . . . . degrees	90
	Handwheel graduated to read to thousandths.	
Wheel Spindle Slide	Vertical adjustment . . . . . inches	8
	Handwheel graduated to read to half thousandths.	
Wheel Spindle	Belt width . . . . . inches	1¼
	Spindle Speed { Number of changes	3
	Spindle Speed { Range . . . . . r.p.m.	2513, 3771, 5656
	Takes Wheels { Diameter . . . . . inches	1 to 7
	Takes Wheels { Thickness (straight wheels) . . . . . inches	¼ to ½
	Takes Wheels { Width (cupped wheels) . . . . . inches	1½ and 2
Swivel Table	T-slots { Number	1
	T-slots { Width . . . . . inches	½
	Swivels either side of zero to . . . . . degrees	90
	Swivel scale reads to degrees.	
	Scale on end reads to . . . . . inches of taper per ft.	3
Center Rest	Takes work to . . . . . diam., inches	2
Table Speed	Number of changes	4
	Range . . . . . In. per min.	12 to 76
Headstock	Front end threaded	6 R.H., Ntl. Std.
	Front end diameter . . . . . inches	1½
	Taper hole . . . . . No.	6
Work Speed	Number of changes	4
	Range . . . . . r.p.m.	119 to 566
Countershaft	Tight and loose pulleys . . . . . diam., inches	6
	Belt width . . . . . inches	2½
	Speed . . . . . r.p.m.	425
Universal Head	Vertical adjustment . . . . . inches	4
	Can be set to any angle in vertical and horizontal planes either side of zero, to . . . . . degrees	90
	Swing over table . . . . . diam., inches	16
	With head at right angles to table, takes light work to . . . . . diam., inches	24
Floor Space	Parallel to spindle . . . . . inches	84
	At right angles to spindle . . . . . inches	45
Weights (Approx.)	Net { Machine . . . . . lbs.	2050
	Net { Countershaft . . . . . lbs.	490
	Shipping (including countershaft) . . . . . lbs.	3050
Equipment	Everything shown in cuts, together with countershaft.	

*Maximum surface which can be ground cylindrically with wheel spindle parallel to table ways, 15″.

Tool Cupboard

For No. 13 Universal and Tool Grinding Machine



This cupboard is conveniently arranged for holding the various parts and attachments that are usually used on the No. 13 Universal and Tool Grinding Machine.

It is made substantially of wood and fitted with shelves, brackets, pins, etc., to accommodate the parts in as little space as practicable.

Dimensions. Height, 39″. Floor space, 16″ x 38″.

Weights. Net, 100 lbs. Shipping, 200 lbs.

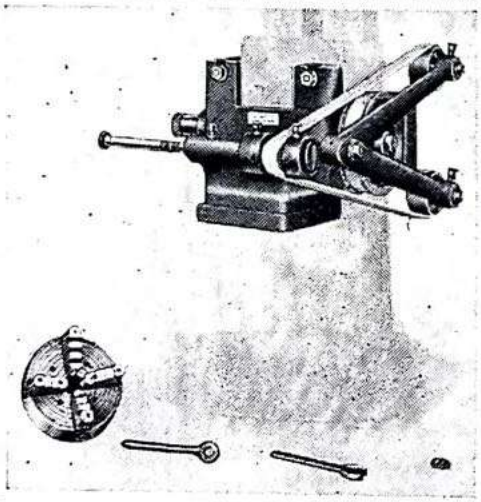
Index Centers

For No. 13 Universal and Tool Grinding Machine

These Index Centers swing work 8″ in diameter and consist of the 4¾″ Index Centers shown on page 135 equipped with raising blocks.

Internal Grinding Attachment

For No. 13 Universal and Tool Grinding Machine



This attachment consists of a knee which can be fastened to the front of the wheel slide by four bolts. The knee carries a belt-tightener arm provided with two idler pulleys; it also carries a regular Internal Grinding Fixture such as is used on the Universal Grinding Machines. The internal spindle is driven by an endless canvas belt from a pulley on the main spindle as shown in the cut. No. 03 Fixture is regularly furnished with the attachment, but Nos. 01, 02 or 04 can be substituted without extra charge. See page 110 for capacities of the four sizes.

Equipment. 2 grinding wheels, 4″ 4-jawed Independent Chuck, belt, driving pulley and everything else shown in cut.

Weights. Net, 55 lbs. Shipping, 72 lbs.

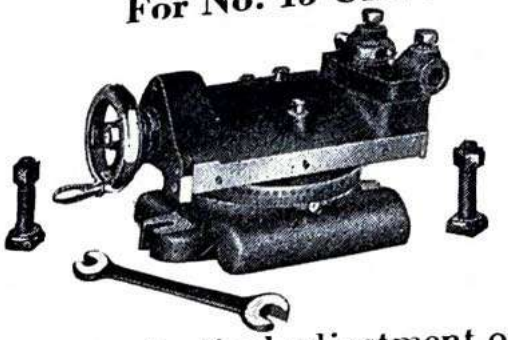
Spring Chuck No. 350

For No. 13 Universal and Tool Grinding Machine

Holds conveniently bushings, needle valves, wire, long thin rods, etc., through headstock. A No. 11 Spring Collet is held in place by a knurled nut that forces it against a taper seat and closes the chuck concentrically. See page 554.

Angular Wheel Truing Attachment

For No. 13 Universal and Tool Grinding Machine



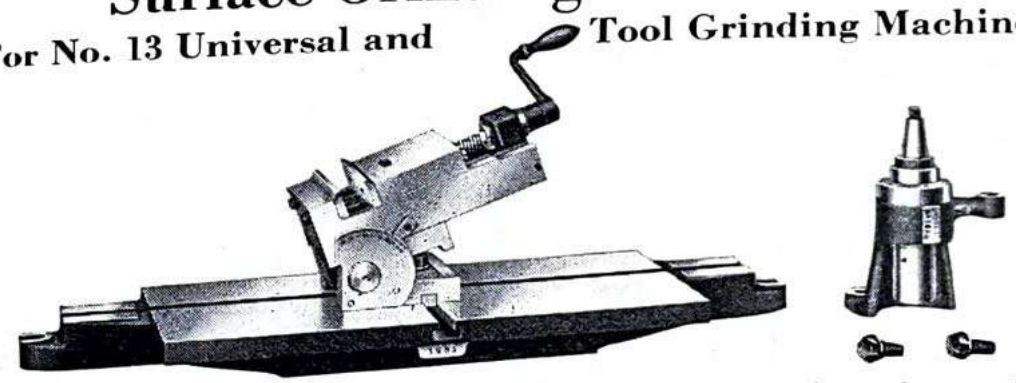
This attachment provides an accurate, efficient and simple means of producing angular shapes upon grinding wheels. Face angles up to 90° and numerous combinations of angular shapes are easily developed.

The swivel, whose scale is graduated in degrees 45° either side of two zeros 90° apart, carries the slide having a longitudinal adjustment of 2¼". The tool holder swivels and holds a diamond tool. Weights. Net 25 lbs. Shipping, 33 lbs.

Diamond can be furnished as an extra.

Surface Grinding Attachment

For No. 13 Universal and Tool Grinding Machine



This attachment is adaptable to all varieties of surface grinding within the capacity of the machine.

No. 1 Adjustable Vise furnished. Described below. Wheel spindle extension is supported in self-aligning bearing, carried in a bracket bolted to the wheel slide, allowing the wheel to be used over the entire surface of the table plate. Table plate has a working surface 17" x 7⅜" x 1¾" thick; 2 T-slots, ½" wide, at right angles. Weights. Net, 68 lbs. Shipping, 80 lbs.

Face Mill Grinding Attachment

For No. 13 Universal and Tool Grinding Machine

Settings are readily made with this attachment for sharpening the side, periphery and corners of the teeth of face milling cutters up to 18½" diameter. Attachment spindle has No. 12 B&S and No. 50 Milling Machine Standard taper holes. Weights. Net, 71 lbs. Shipping, 82 lbs.

Adapters, Draw-in Bolts and **Collets** can be furnished as extras.

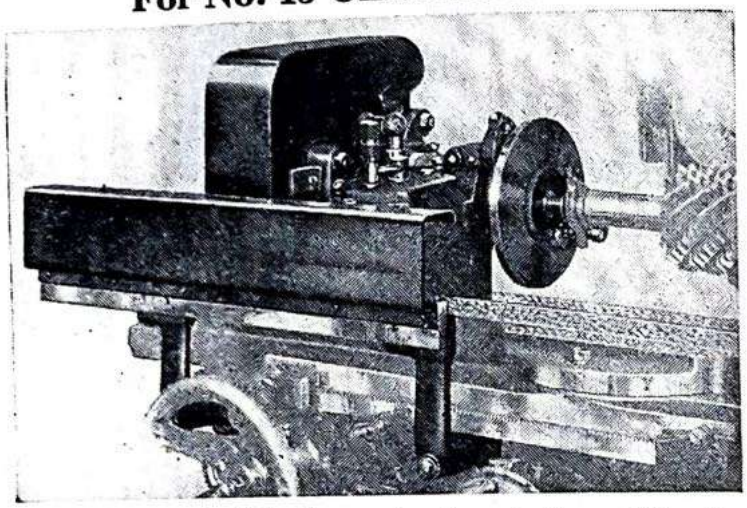
No. 1 Adjustable Vise

For No. 13 Universal and Tool Grinding Machine

This is a very convenient vise for holding many jobs ordinarily performed on this machine. See page 606.

Hob Grinding Attachment

For No. 13 Universal and Tool Grinding Machine



It is only by mechanical means that a spirally grooved hob can be accurately sharpened so that the correct lead of the grooves will be preserved and the teeth ground radially and equidistant. For this reason the Hob Grinding Attachment quickly and accurately sharpens hobs of any lead, either right or left hand. It is also suitable for grinding hobs with straight flutes.

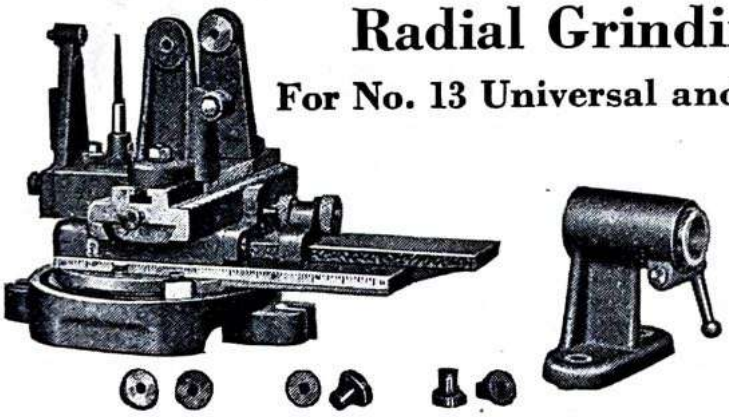
Hobs up to 12″ in length and up to 8″ in dia. can be accommodated.

Two index plates providing for hobs of from 2 to 20 grooves, together with the necessary change gears, two wheel arbors and a printed table of gears and spirals, are furnished with the attachment.

Weights. Net, about 115 lbs. Shipping, 160 lbs.

Radial Grinding Attachment

For No. 13 Universal and Tool Grinding Machine



The Radial Grinding Attachment is for grinding convex and concave cutters and work of similar character, and to grind a radius on the corners of cutter teeth or similar operations.

Capacity	Work Slide { Adjustable to grind any radius to . . inches Scale graduated to 64ths	4½
	Cross Slide { Adjustable either side of zero to . . . inches Scale graduated to 64ths	2
Work Holders	Take in length . . . . . inches	5
	Swing in diameter . . . . . inches	8
	Taper hole in bushing in taper shank holder . . . . . No.	10
Weights	Net . . . . . lbs.	65
	Shipping . . . . . lbs.	80
Equipment	8 bushings for ⅞″, 1″, 1 1/16″ and 1¼″ holes; diamond point and holder.	

Bushings

For No. 13 Universal and Tool Grinding Machine

Bushings for Nos. 10, 20 or 30 Milling Machine Standard taper shanks can be furnished.

Magnetic Chucks

For No. 13 Universal and Tool Grinding Machine

These chucks are found very convenient, especially when grinding small, flat pieces.

Circular giving detailed information and prices mailed upon request.

Magnetic Chuck Table Plate can be furnished as an extra for mounting 6″ x 17″ capacity magnetic chuck on the machine table.

Weights. Net, 23 lbs. Shipping, 30 lbs.

Magnetic Chuck Generator

For No. 13 Universal and Tool Grinding Machine

This equipment furnishes current for a magnetic chuck when direct current is not otherwise available.

On motor driven machines, the generator is driven direct by the main motor and mounted on the auxiliary plate provided, which fastens to the main motor base.

For belt driven machines, the generator is usually mounted on wall or ceiling where it may be driven conveniently from shafting.

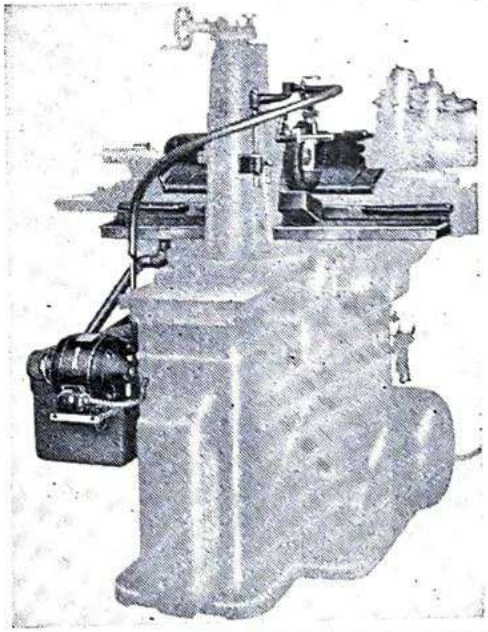
Weights. Net, 39 lbs. Shipping, 45 lbs.

Wet Grinding Attachment

For No. 13 Universal and Tool Grinding Machine

This attachment conveniently handles the wet grinding of cylindrical work. It consists of a No. 2 Centrifugal Pump delivering an ample supply of water to the grinding wheel through suitable piping that is adjustable to any required height and swivels in any direction. The special cast iron guard for the grinding wheel insures protection to the operator and confines the water to its proper course. A set of telescopic water guards for the table also protects the operator from spray. Fastened to the rear of the sliding table is a trough which catches the water dripping from the work and conveys it back to the tank. In the water tank a settling pan is provided to collect the sediment which might otherwise clog the pump. The settling pan can be easily removed for cleaning.

Weights. Net, 195 lbs. Shpg., 265 lbs.



Wet Grinding Attachment

Motor Driven

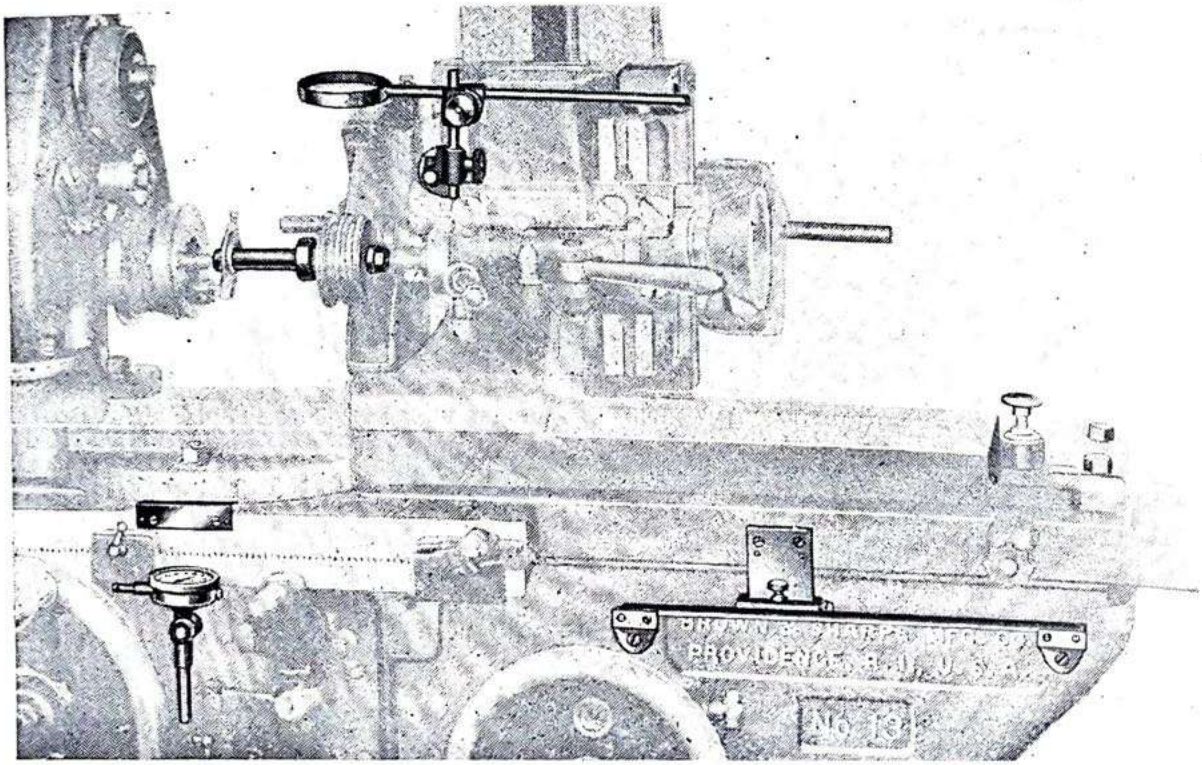
For No. 13 Universal and Tool Grinding Machine (Motor Driven)

This is similar in design to the attachment described above except the water tank is placed on the opposite side of the machine and the pump is driven by a constant speed motor as shown.

Weights. Net, 190 lbs. Shpg., 250 lbs.

Circular Forming Tool Grinding Equipment

For No. 13 Universal and Tool Grinding Machine



This equipment permits the accurate finishing, after hardening, of intricate forms of screw machine forming tools and similar work. It is particularly useful for sharp corners and narrow slots, which could not be otherwise obtained, especially in high speed steel. The various parts can be readily applied to the machine.

The following units can be furnished either separately or as a complete equipment:

Floating Arbor (For Nos. 2, 4 and 6 Auto. Screw Machine Tools).
Floating Arbor (For Nos. 00 and 0 Auto. Screw Machine Tools).
Radius Truing Device for Grinding Wheel.
Diamond for Radius Truing Device for Grinding Wheel.
Reading Glass.
Table Travel Scale and Vernier.
Table Travel Dial Indicator.
Swivel Table Vernier.
Upright Vernier.

Weight (complete). Net, 29 lbs. Shipping, 36 lbs.

Screw machine forming tools ground with this equipment.

Gear Cutting and Hobbing Machines

B·S

Spur Gear Cutting
Spur and Bevel Gear Cutting
Spur Gear Hobbing
Spur and Spiral Gear Hobbing
Attachments

Automatic Gear Cutting Machines

The Gear Cutting Machines are used for cutting spur and bevel gears and also for clutches, splined shafts, etc. The ease of set-up particularly fits them for work requiring quick shifts from one size of gear to another, or for short runs.

The bed of these machines is a heavy, rigid casting giving exceptional stability. The upright is heavily ribbed and cast integral with the bed thus assuring a firm support for the index wheel and the work slide.

The indexing mechanism is of such design that its accuracy is not impaired by constant use. The index wheel is very accurately made and finished cut in position on the machine. The index worm is easily disengaged from the wormwheel when truing work arbors, etc. The large diameter of the index wheel gives assurance of accurate gears.

The cutter spindle is located close to the ways to eliminate vibration. A balance wheel assures smooth cutting action and permits fast cutting speeds at coarse feeds. The system of gibbing used on the work spindle slide prevents misalignment when the clamping bolts are loosened for resetting. On the larger machines the work spindle slide can be raised by power.

An ample supply of cutter coolant is assured by the large coolant tank in the base of the machines.

The chip space is large and easily cleaned. All controls for the work spindle and cutter slide are conveniently located.

All Brown & Sharpe gear cutting machines can be furnished either overhead or motor driven.

Gear Hobbing Machines

The upright and bed of these machines is made a heavy, reinforced casting to give the rigidity and stability which play such an important part in the accuracy and production of a hobbing machine.

The index wheel is of the finest gray iron and is finished hobbed in its operating position, assuring the greatest accuracy. The index worm is ground and runs in oil. It is easily disengaged from the worm-wheel, enabling the work spindle to be turned by hand for truing work arbors, etc.

The hob swivel can be securely clamped in position. The low compact design of the hob slide locates the hob spindle close to the ways. The hob swivel can be accurately set for the cutting angle. The hob slide is long and rests on large, wide bearings. Power fast travel is provided in either direction. A balance wheel mounted directly on the hob spindle steadies the cutting action and prolongs hob life.

Endwise adjustment of the hob is provided, permitting it to be used from end to end before resharpening.

Ease of operation is assured by the convenient location of all operating controls which are grouped at the right-hand end of the machine. Power advance and return of the hob slide at fast travel and automatic feed stop and throw-out are provided.

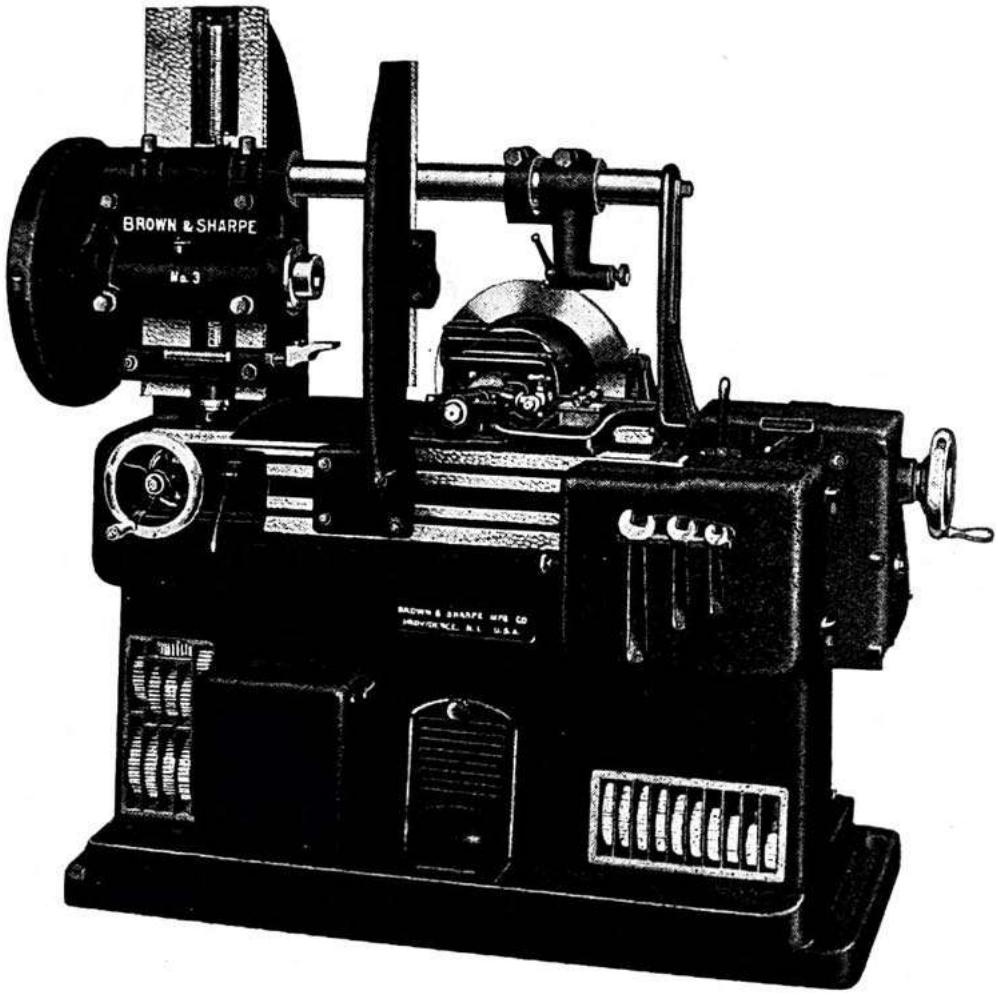
The speed gears are clutched and held in position by keyed washers and nuts. The feed case bearings are oiled from a trough in the case from which oil is fed by gravity.

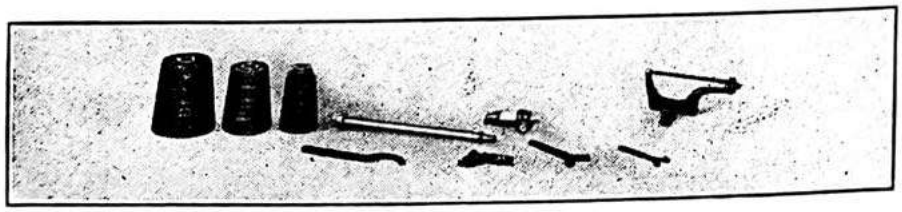
In the event of a roughing and then a finishing operation at one setting of the work on the arbor, the use of the power fast travel with hob either stationary or rotating is a time saving feature.

The differential for hobbing spur or spiral gears on the No. 44 machine permits the use of any feed regardless of the gearing for index or lead. One setting of lead gears answers when cutting any number of teeth of mating gears of any ratio.

Both machines can be furnished either overhead or motor driven.

No. 3
Automatic Gear Cutting Machine





Capacity	Spur gears to {Diameter	36″
	Spur gears to {Face (at maximum pitch)	11″
	Cast iron, diametral pitch	4
	Steel, diametral pitch	5
	Power required	3 H.P.

No. 3 Automatic Gear Cutting Machine

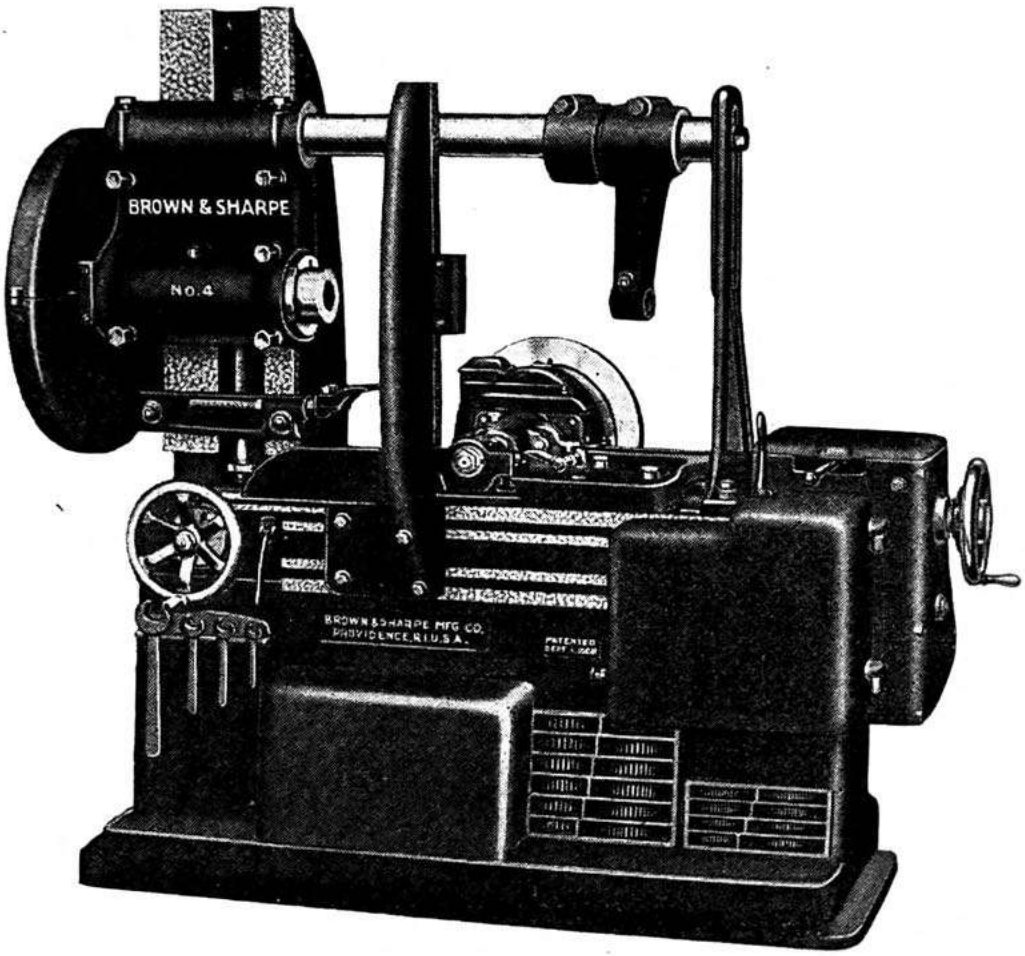
Capacity		Spur Gears — Diameter ..... inches	36
		Spur Gears — Face (at maximum pitch) ..... inches	11
		Travel of Cutter Slide — Max. ..... inches	12¾
		Travel of Cutter Slide — Min. ..... inches	9/16
		Diametral Pitch — Cast iron	4
		Diametral Pitch — Steel	5
		All numbers of teeth	12 to 52
		All numbers of teeth except prime numbers and their multiples	52 to 400
Drive	Motor	By chain and sprockets.	
	Over-head	Pulley ..... diam., inches	12
		Belt width ..... inches	3½
		Pulley speed ..... r.p.m.	500
Cutter Spindle		Diameter ..... inches	1
		Takes Cutters to — Diameter ..... inches	3¾
		Takes Cutters to — Thickness ..... inches	1¾
		Speed — No. changes	12
		Speed — Range ..... r.p.m.	60 to 301
Cutter Slide		No. changes of feed	16
		Range ..... in. per min.	1 5/16 to 24
		Return ..... ft. per min.	15
Work Spindle		Taper hole ..... No.	12
		Hole through ..... diam., inches	1 5/16
Overarm		Clears gears to ..... diam., inches	11¾
Cutter coolant pump capacity ..... gallons per min.			2
Countershaft		Pair tight and loose pulleys ..... diam., inches	14
		Belt width ..... inches	4
		Speed ..... r.p.m.	500
Floor Space		At right angles to cutter spindle ..... inches	80
		Parallel to cutter spindle ..... inches	57
Weights (Approx.)		Net — Belt drive — Machine ..... lbs.	3900
		Net — Belt drive — Countershaft ..... lbs.	175
		Net — For motor ..... lbs.	3950
		Net — With motor ..... lbs.	4150
		Shipping — Belt drive (with countershaft) ..... lbs.	4450
		Shipping — For motor ..... lbs.	4500
		Shipping — With motor ..... lbs.	4700
Equipment		Tables, countershaft and everything shown in cuts.	

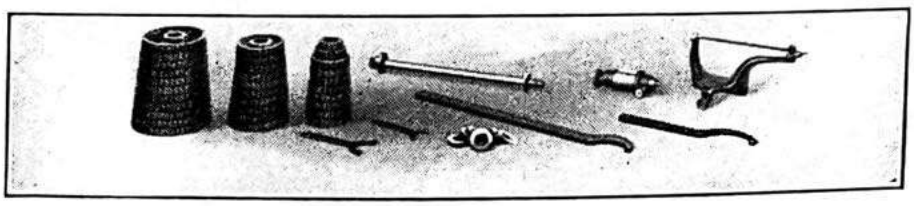
Furnished as Extra—

Cutter spindles of smaller diameter.

Face plate for work spindle, 12″ diameter.

No. 4
Automatic Gear Cutting Machine





Capacity	Spur gears to {Diameter	48″
	Spur gears to {Face (at maximum pitch)	10″
	Cast iron, diametral pitch	2½
	Steel, diametral pitch	3
	Power required	5 H.P.

No. 4 Automatic Gear Cutting Machine

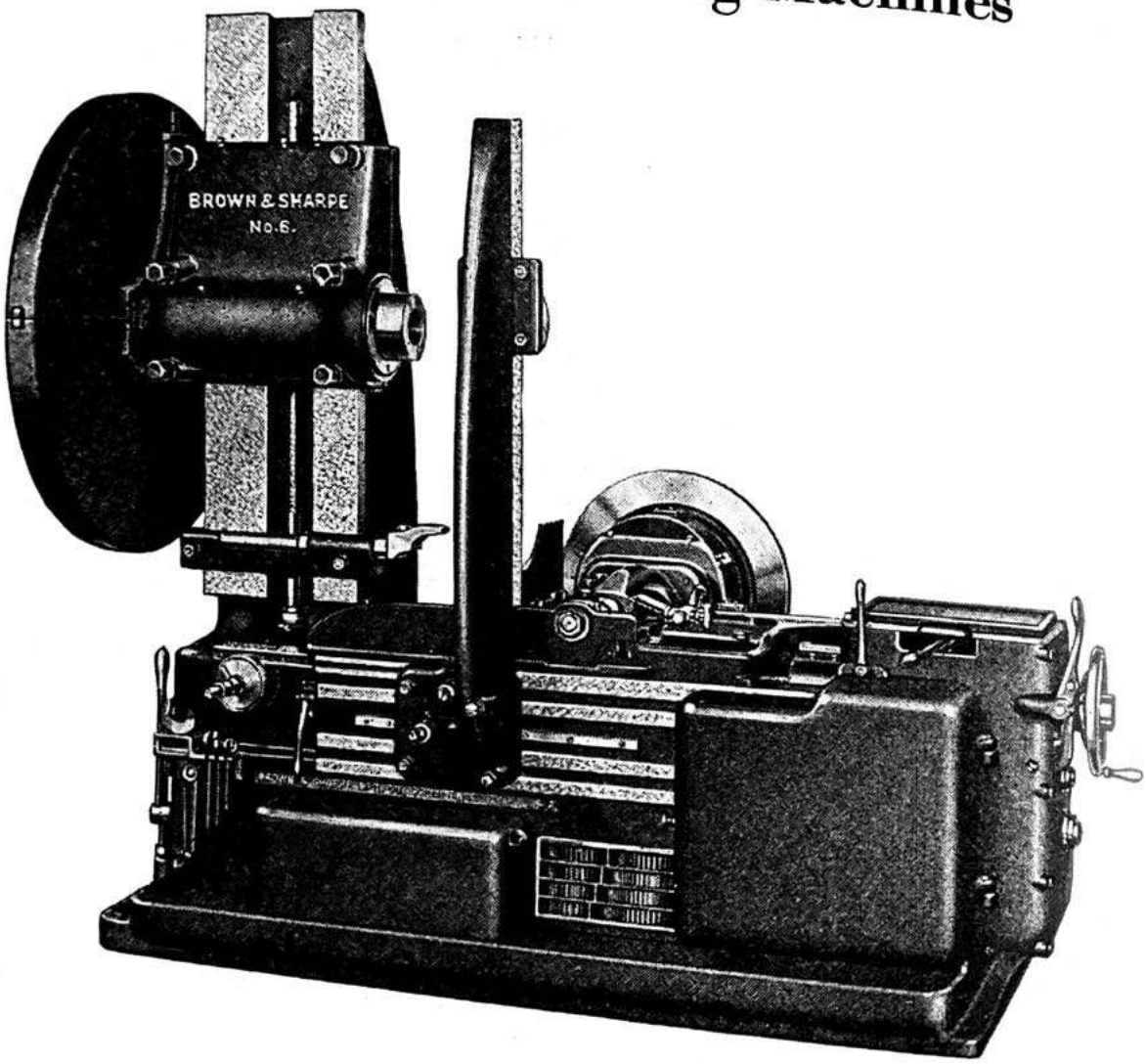
Capacity		Spur Gears — Diameter ..... inches	48
		Spur Gears — Face (at maximum pitch) ..... inches	10
		Travel of Cutter Slide — Max. ..... inches	12 1/4
		Travel of Cutter Slide — Min. ..... inches	1 3/16
		Diametral Pitch — Cast iron	2 1/2
		Diametral Pitch — Steel	3
		All numbers of teeth	12 to 52
		All numbers of teeth except prime numbers and their multiples	52 to 400
Drive	Motor	By chain and sprockets.	
	Over-head	Pulley ..... diam., inches	13
		Belt width ..... inches	4
		Pulley speed ..... r.p.m.	380
Cutter Spindle		Diameter ..... inches	1 1/4
		Takes Cutters to — Diameter ..... inches	5
		Takes Cutters to — Thickness ..... inches	2 1/2
		Speed — No. changes	12
		Speed — Range ..... r.p.m.	30 to 161
Cutter Slide		Feed — No. changes	16
		Feed — Range ..... in. per min.	13/16 to 15 3/4
		Return ..... ft. per min.	15
Work Spindle		Taper hole ..... No.	14
		Hole through ..... diam., inches	1 13/16
Overarm		Clears gears to ..... diam., inches	20
Cutter coolant pump capacity ..... gallons per min.			6 1/2
Countershaft		Pair tight and loose pulleys ..... diam., inches	16
		Belt width ..... inches	5
		Speed ..... r.p.m.	380
Floor Space		At right angles to cutter spindle ..... inches	85
		Parallel to cutter spindle ..... inches	64
Weights (Approx.)		Net — Belt drive — Machine ..... lbs.	5425
		Net — Belt drive — Countershaft ..... lbs.	225
		Net — For motor ..... lbs.	5625
		Net — With motor ..... lbs.	5800
		Shipping — Belt drive (with countershaft) ..... lbs.	6350
		Shipping — For motor ..... lbs.	6325
		Shipping — With motor ..... lbs.	6675
Equipment		Tables, countershaft and everything shown in cuts.	

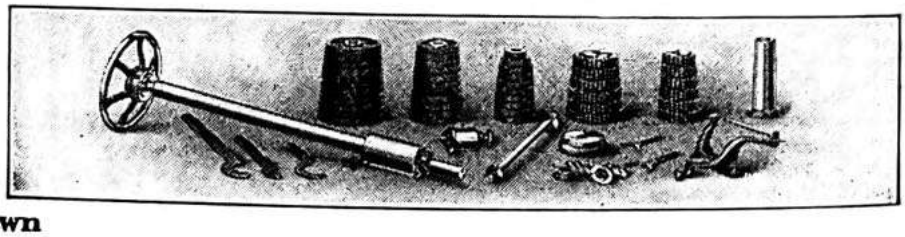
Furnished as Extra—

Cutter spindles of smaller diameter.

Face plate for work spindle, 24″ diameter.

Nos. 5 and 6
Automatic Gear Cutting Machines





No. 6 shown

		No. 5	No. 6
Capacity	Spur gears to Diameter	60″	76″
	Spur gears to Face (at maximum pitch)	11″	13″
	Cast iron, diametral pitch	2	1½
	Steel, diametral pitch	2½	1¾
	Power required	7½ H.P.	10 H.P.

Nos. 5 and 6 Automatic Gear Cutting Machines

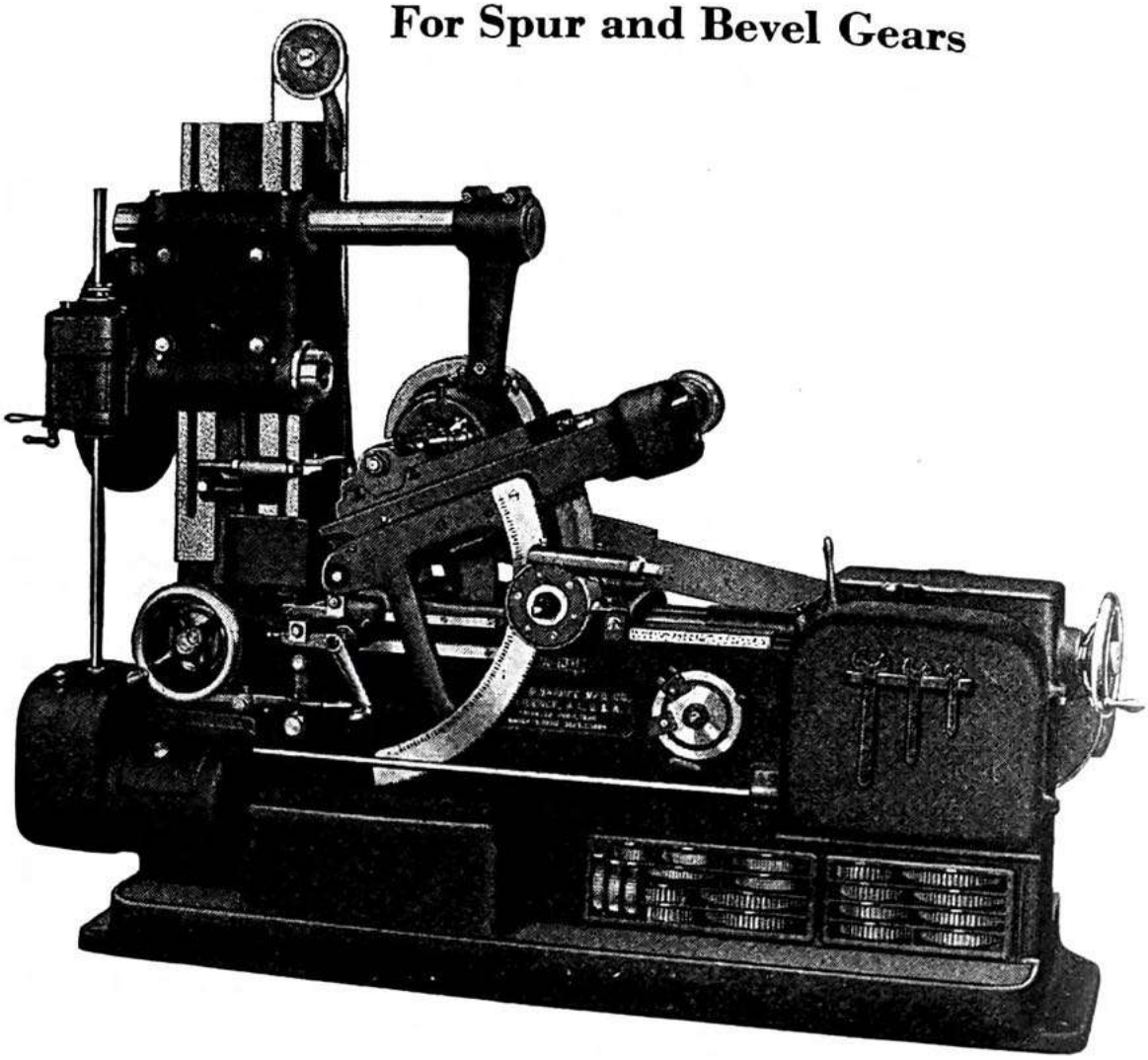
			No. 5	No. 6
Capacity		Spur Gears: Diameter . . . . . inches	60	76
		Spur Gears: Face (at max. pitch) inches	11	13
		Travel of Cutter Slide: Max. . . . . inches	14½	16
		Travel of Cutter Slide: Min. . . . . inches	1 7/16	1 11/16
		Diametral Pitch: Cast iron	2	1½
		Diametral Pitch: Steel	2½	1¾
		All numbers of teeth	12 to 52	12 to 52
		All numbers of teeth except prime numbers and their multiples	52 to 400	52 to 400
Drive	Motor	By chain and sprockets.		
	Overhead	Pulley . . . . . diam., inches	15	18
		Belt width . . . . . inches	5	6
		Pulley speed . . . . . r.p.m.	360	340
Cutter Spindle		Diameter . . . . . inches	1½	1¾
		Takes Cutters to: Diameter . . . . . inches	5¾	7
		Takes Cutters to: Thickness . . . . . inches	4	4¾
		Speed: No. changes	12	12
		Speed: Range . . . . . r.p.m.	25 to 102	19 to 76
Cutter Slide		Feed: No. changes	16	16
		Feed: Range . . . . . In. per min.	11/16 to 12⅞	11/16 to 12⅞
		Return . . . . . Ft. per min.	15	15
Work Spindle		Taper hole . . . . . No.	16	18
		Hole through . . . . . diam., inches	2 1/16	2⅜
Cutter coolant pump capacity . . . . . gallons per min.			8	9¼
Expansion bushing furnished . . . . . diam., inches			3	4
Countershaft		Pair tight and loose pulleys . . . . . diam., inches	18	18
		Belt width . . . . . inches	5	7
		Speed . . . . . r.p.m.	360	340
Floor Space		At right angles to cutter spindle . inches	103	120
		Parallel to cutter spindle . . . . . inches	74	87
Weights (Approx.)		Net: Belt drive: Machine . . . . . lbs.	7250	12,220
		Net: Belt drive: Countershaft . . . lbs.	380	480
		Net: For motor . . . . . lbs.	7300	12,575
		Net: With motor . . . . . lbs.	7600	13,115
		Shipping: Belt drive (with countershaft) . . . . . lbs.	8650	13,800
		Shipping: For motor . . . . . lbs.	8325	13,675
		Shipping: With motor . . . . . lbs.	8650	14,225
Equipment		Tables, countershaft, withdrawing expansion arbor (on No. 6), and everything shown in cuts.		

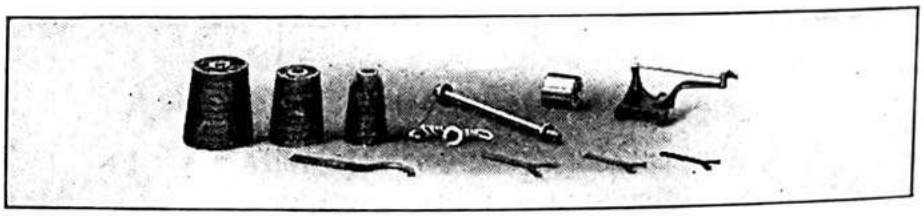
Furnished as Extra—

Cutter spindles of smaller diameter.

Face plate for work spindle, 24″ diameter (24″ and 40″ diameter on No. 6).

No. 13 Heavy
Automatic Gear Cutting Machine
For Spur and Bevel Gears





Capacity	Spur and bevel gears to { Diameter	24″
	Face (at maximum pitch)	6″
	Cast iron, diametral pitch	3
	Steel, diametral pitch	4
	Power required	5 H.P.

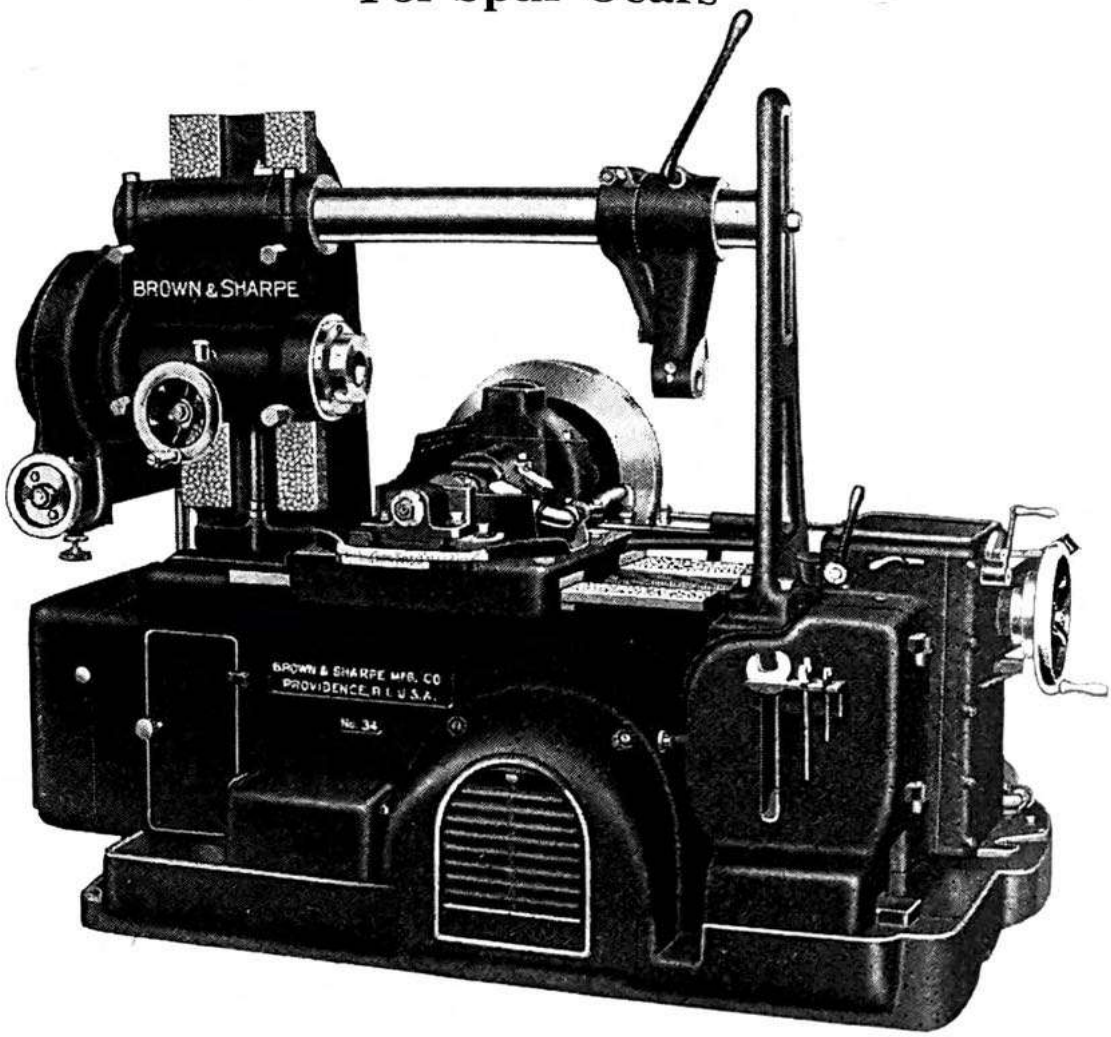
No. 13 Heavy Automatic Gear Cutting Machine

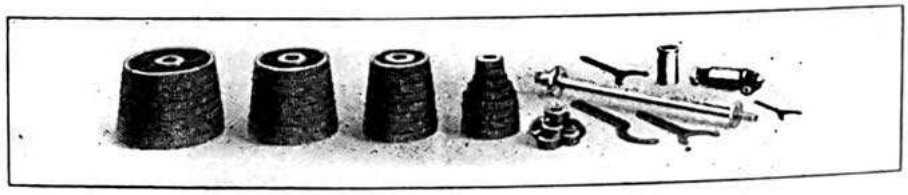
Capacity		Spur and Bevel Gears — Diameter ..... inches	24
		Spur and Bevel Gears — Face (at maximum pitch) ..... inches	6
		Travel of Cutter Slide — Max. ..... inches	8
		Travel of Cutter Slide — Min. ..... inches	5/8
		Diametral Pitch — Cast iron	3
		Diametral Pitch — Steel	4
		All numbers of teeth	12 to 52
		All numbers of teeth except prime numbers and their multiples	52 to 400
Drive	Motor	By chain and sprockets.	
	Over-head	Pulley diameter ..... inches	14
		Belt width ..... inches	4
		Pulley speed ..... r.p.m.	350
Cutter Spindle		Diameter ..... inches	1¼
		Takes Cutters to — Diameter ..... inches	4¾
		Takes Cutters to — Thickness ..... inches	3
		Speed — No. changes	12
		Speed — Range ..... r.p.m.	30 to 156
Cutter Slide		Adjustable to ..... degrees	90
		Feed — No. changes	16
		Feed — Range ..... in. per min.	13/16 to 15¾
		Return ..... ft. per min.	7½
Work Spindle		Taper hole ..... No.	14
		Hole through ..... diam., inches	1 13/16
Overarm		Clears gears to ..... diam., inches	20
Cutter coolant pump capacity ..... gallons per min.			4½
Countershaft		Pair tight and loose pulleys ..... diam., inches	14
		Belt width ..... inches	4½
		Speed ..... r.p.m.	377
Floor Space		At right angles to spindle ..... inches	103
		Parallel to spindle ..... inches	47
Weights (Approx.)		Net — Belt drive — Machine ..... lbs.	6100
		Net — Belt drive — Countershaft ..... lbs.	205
		Net — For motor ..... lbs.	6175
		Net — With motor ..... lbs.	6450
		Shipping — Belt drive (with countershaft) ..... lbs.	7125
		Shipping — For motor ..... lbs.	6975
		Shipping — With motor ..... lbs.	7275
Equipment		Tables, countershaft and everything shown in cuts.	

Furnished as Extra—

Cutter spindles of smaller diameter.

No. 34
Gear Hobbing Machine
For Spur Gears



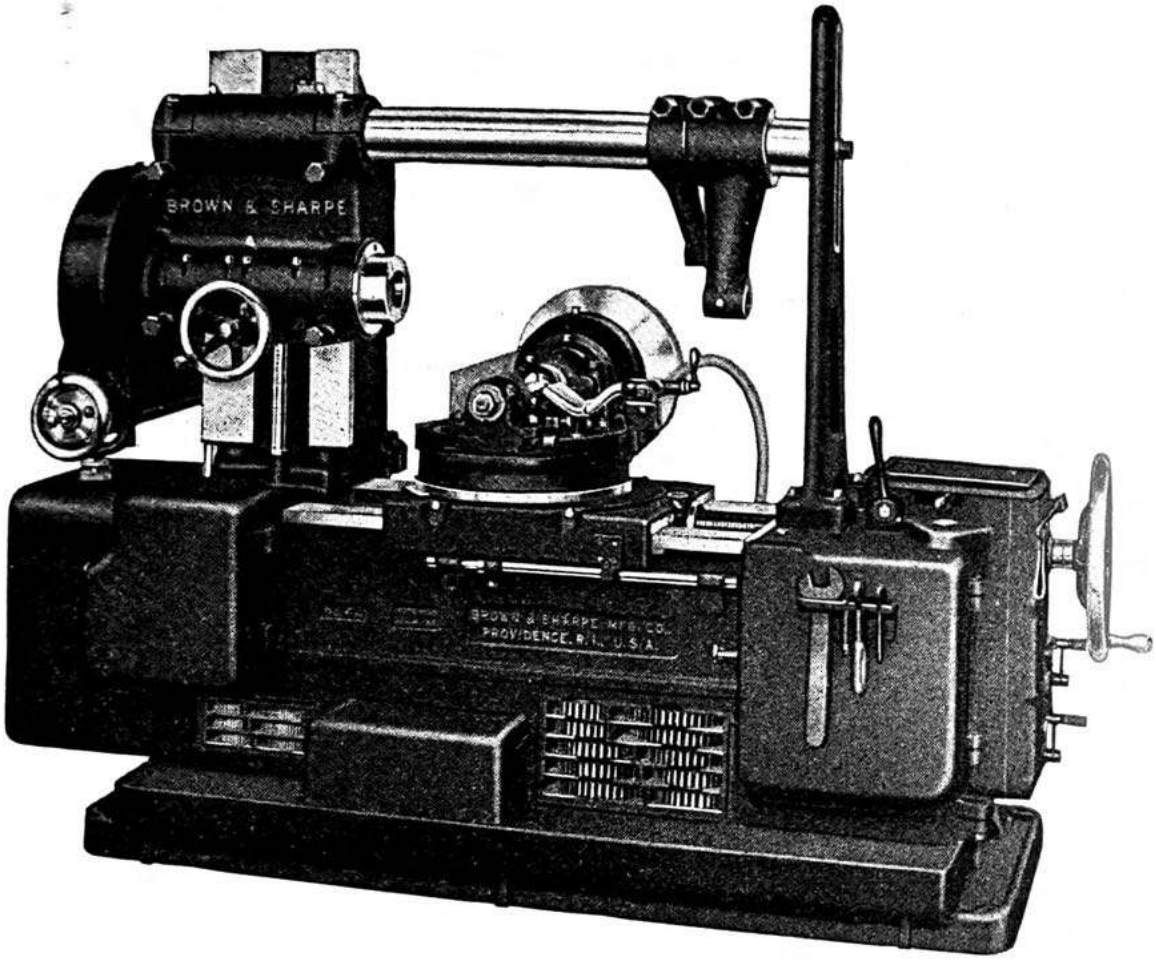


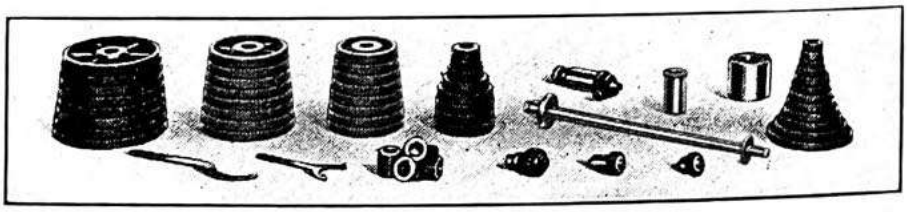
Capacity	Spur gears to { Diameter	20″
	Spur gears to { Face (at maximum pitch)	12″
	Cast iron, diametral pitch	3
	Steel, diametral pitch	4
	Power required	5 H.P.

No. 34 Gear Hobbing Machine

Capacity		Spur Gears: Diameter ... inches	20
		Spur Gears: Face (at maximum pitch) ... inches	12
		Travel of Hob Slide: Max. ... inches	15⅞
		Travel of Hob Slide: Min. ... inches	⅜
		Diametral Pitch: Cast iron ...	3
		Diametral Pitch: Steel ...	4
		All numbers of teeth ...	12 to 52
		All numbers of teeth except prime numbers and their multiples ...	52 to 150
Drive	Motor	By chain and sprockets (dry-disk clutch in sprocket)	
	Over-head	Pulley (has dry-disk clutch) ... diam., inches	14
		Belt width ... inches	4
		Constant speed of pulley ... r.p.m.	500
Hob Spindle		Diameter ... inches	1¼ or 1½
		Takes Hobs to: Diam. ... inches	5
		Takes Hobs to: Any standard length	
		Takes Hobs to: Key size: For 1¼″ Spindle ... inches	¼ x ⅛
		Takes Hobs to: Key size: For 1½″ Spindle ... inches	⅜ x 3/16
		End adjustment ... inches	1½
		Speed: No. changes ...	10
		Speed: Range ... r.p.m.	57.9 to 213
Hob Slide		Swivel adj. (R.H. hobs only) forward of zero to ... degrees	10
		Vernier scale reads to ... minutes	1
		No. changes of feed ...	12
		Range of feed ... In. per rev. of work	.034 to .204
		Power advance and return ... In. per min.	92
Work Spindle		Taper hole ... No.	16
		Hole through ... diam., inches	2½
Overarm		Clears gears to ... diam., inches	20
		Diameter ... inches	4½
Arbor Bushing furnished ... diam., inches			1⅜
Hob Coolant		Capacity of tank ... gallons	25
		Pump capacity ... gallons per min.	10
Floor Space		At right angles to hob spindle, with covers open ... inches	104
		Parallel to hob spindle, with covers open ... inches	57
Weights (Approx.)		Net: Belt drive ... lbs.	7200
		Net: For motor ... lbs.	7450
		Net: With motor ... lbs.	7800
		Shipping: Belt drive ... lbs.	8025
		Shipping: For motor ... lbs.	8275
		Shipping: With motor ... lbs.	8625
Equipment		Tables and everything shown in cuts.	
Furnished as Extra—			
Adjustable rim rest to furnish additional support for large blanks.			
Countershaft		Tight and loose pulleys ... diam., inches	14
		Belt width ... inches	4½
		Speed ... r.p.m.	500
		Net Weight ... lbs.	225

No. 44
Gear Hobbing Machine
For Spur and Spiral Gears





Capacity	Spur and spiral gears to { Diameter	20″
	Face (at maximum pitch)	10″
	Cast iron, diametral pitch	3
	Steel, diametral pitch	4
	Power required	5 H.P.

No. 44 Gear Hobbing Machine

Capacity		Spur and Spiral Gears — Diameter ..... inches	20
		Spur and Spiral Gears — Face ..... inches	10
		Travel of Hob Slide — Max. ..... inches	13
		Travel of Hob Slide — Min. ..... inches	3/8
		Diametral Pitch — Cast iron	3
		Diametral Pitch — Steel	4
		Minimum Lead ..... inches	5*
		All numbers of teeth	12* to 50
		All numbers of teeth except prime numbers and their multiples	50 to 120
Drive	Motor	By gears (dry-disk clutch in gear).	
	Overhead	Pulley (has dry-disk clutch) ..... diam., inches	14
		Belt width ..... inches	4
		Constant speed of pulley ..... r.p.m.	410
Hob Spindle		Diameter ..... inches	1¼ or 1½
		Takes Hobs to — Diam. ..... inches	5
		Takes Hobs to — Length ..... inches	7¾
		Key Size — For 1¼" Spindle ..... inches	¼ x 1/8
		Key Size — For 1½" Spindle ..... inches	3/8 x 3/16
		End adjustment ..... inches	1½
		Speed — No. changes	10
		Speed — Range ..... r.p.m.	45 to 166
		Minimum distance, center of work spindle to center of hob spindle ..... inches	2⅛
Hob Slide		Swivel adjustable either side of zero to ..... degrees	90
		Vernier scale reads to ..... minutes	5
		No. changes of feed	12
		Range of feed ..... in. per rev. of work	.010 to .153
		Power advance and return ..... in. per min.	28
Work Spindle		Taper hole ..... No.	16
		Hole through ..... diam., inches	2½
Overarm		Clears gears to ..... diam., inches	20
		Diameter ..... inches	4½
Arbor Bushing furnished ..... diam., inches			1⅜
Hob Coolant		Capacity of tank ..... gallons	25
		Pump capacity ..... gallons per min.	12
Floor Space		At right angles to hob spindle, with covers open ..... inches	104
		Parallel to hob spindle, with covers open ..... inches	57
Weights (Approx.)	Net	Belt drive ..... lbs.	6900
		For motor ..... lbs.	7000
		With motor ..... lbs.	7125
	Shipping	Belt drive ..... lbs.	7600
		For motor ..... lbs.	7775
		With motor ..... lbs.	7900
Equipment		Tables and everything shown in cuts.	

*May be smaller under certain conditions.

Furnished as Extra—

Adjustable Rim Rest to furnish additional support for large blanks.

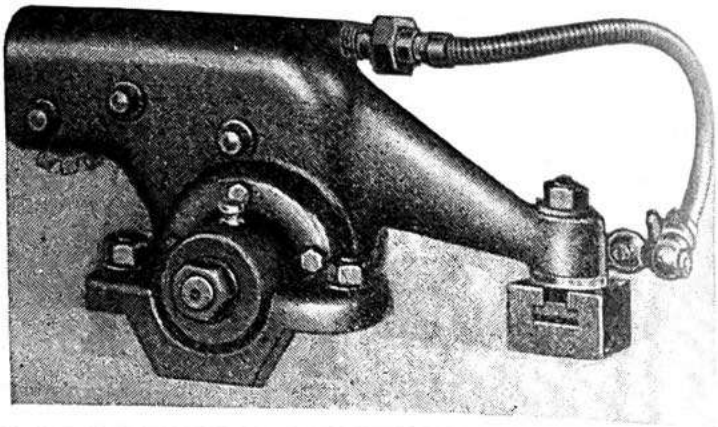
Countershaft	Pair tight and loose pulleys ..... diam., inches	14
	Belt width ..... inches	4½
	Speed ..... r.p.m.	410
	Net weight ..... lbs.	225

Internal Gear Cutting Attachment

For Nos. 3, 4, 5 and 13H Automatic Gear Cutting Machines

When ordering, give size and serial number of machine.

The holder or frame is secured to the cutter slide, and the cutter spindle of the attachment is driven by the main cutter spindle of the machine through a train of gears.



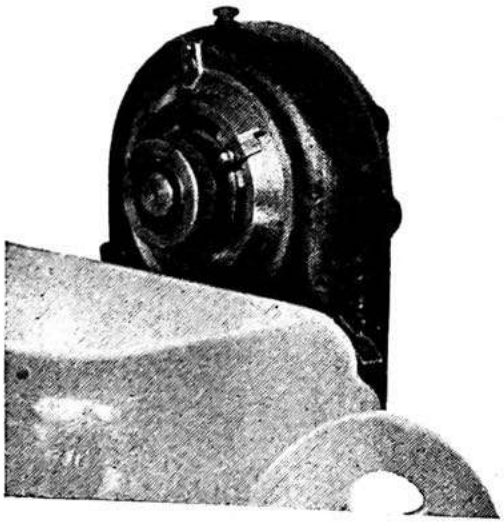
No. of Att.	Mach. where used, No.	Widest face that can be cut, In.	Smallest Inside Diameter of Gear that can be cut, In.	Coarsest Diam. Pitch that can be cut		Diam. of Cutter,* In.	Diam. of Att. Arbor,* In.	Weights	
				Iron	Steel			Net, Lbs.	Shipping, Lbs.
3	3	2⅛	3¼	10	12	2¾	1	37	57
3H	13H	2¼	4¼	8	9	3⅝	1¼	68	82
4	4	3½	4¼	8	9	3½	1¼	65	85
5	5	4¼	5¼	5	6	4½	1½	100	125

*Not furnished with attachment.

Automatic Feed Stop

For Nos. 3 and 4 Automatic Gear Cutting Machines

When ordering, give size and serial number of machine.



The Automatic Feed Stop is useful when it is desired to cut segments, and also when the accuracy required does not permit the cutter passing through the same tooth space twice.

The stop is attached to the back of the feed case and is operated by the reversing rod at the back of the machine. A graduated dial is set for the number of teeth to be cut. The feed stops at the end of the return stroke of the cutter slide when the zero lines on the stop coincide.

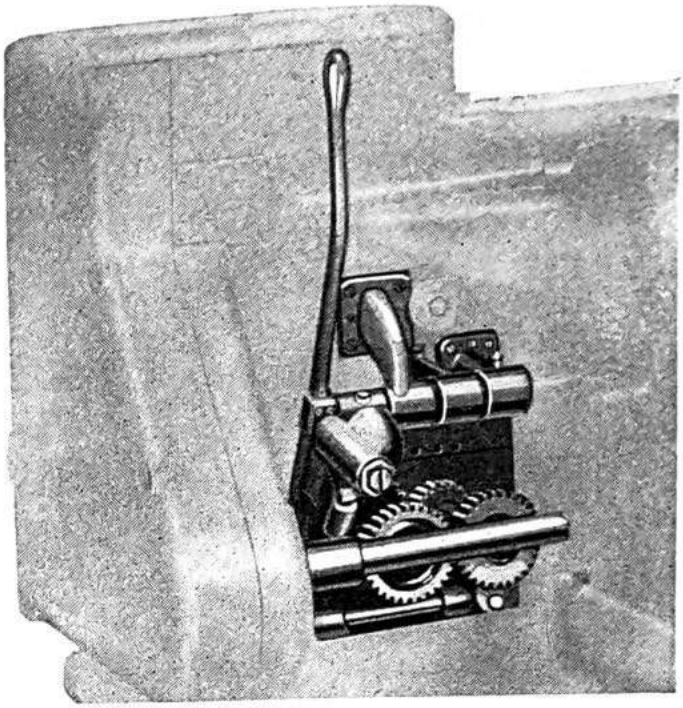
Net Weight, 18 lbs. Shipping Weight, 25 lbs.

Automatic Feed Change Mechanism

For Double Cutters

For Nos. 4, 5 and 6 Automatic Gear Cutting Machines

When ordering, give size and serial number of machine.



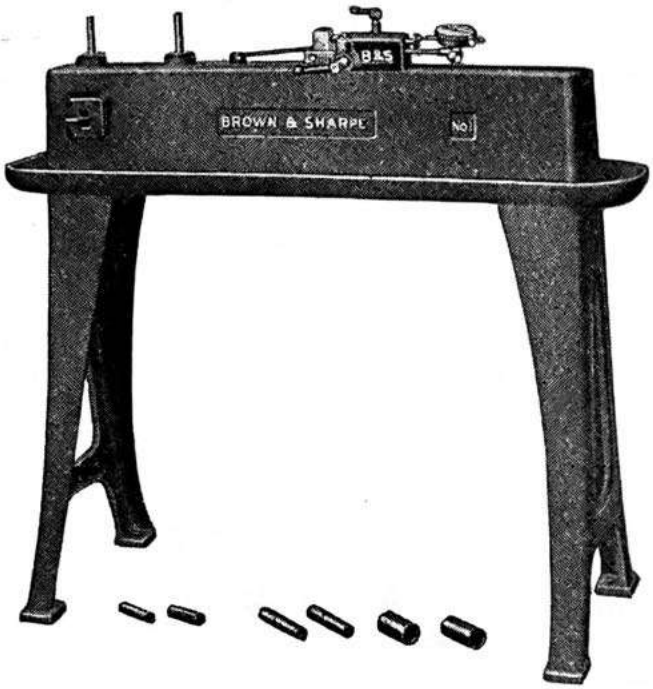
When a large number of gears are to be cut it has been found advantageous to make both the roughing and finishing cut at the same time by the double cutter method.

When cutting the first time through, both cutters must make their first cut through solid stock, which necessitates a slow feed. To avoid the loss of time which feeding by hand or changing the gears would cause, this device automatically changes from the slow feed which is engaged for the first cut, to a feed twice as fast for the remaining cuts.

Machine where used, No.	Beginning with Serial No.	Weights	
		Net, Lbs.	Shipping, Lbs.
4	666	28	45
5	233	40	58
6	219	54	73

This mechanism must be attached at the factory.

No. 1
Spur Gear Testing Machine



The No. 1 Spur Gear Testing Machine permits a shop test for spur gears that closely approaches actual running conditions. A scale and vernier tests center distances. A dial indicator shows run-out and variations to one thousandth of an inch. The machine is suitable for rapid testing under average shop conditions.

Capacity	Distance between centers by thousandths of an inch { Max. . . . . inches Min. . . . . inches	29½ 2
Floor Space	Length . . . . . inches Width . . . . . inches	51⅝ 21
Weights (Approx.)	Net . . . . . lbs. Shipping . . . . . lbs.	400 500
Equipment	4 Studs: 2, ⅝″ dia.; 2, 15/16″ dia.; and 4 bushings: 2, 1″ dia., ⅝″ hole; and 2, 1½″ dia., 15/16″ hole.	

Metric scales, studs and bushings can be furnished in place of English when so ordered.

Furnished as Extra—

Studs, ¼″ to 15/16″ by 16ths	Price each, $4.50
Bushings, 1″ to 3″ by 16ths	Price each, $3.00

Screw Machines

B·S

Automatic Screw
Automatic Turret Forming
Automatic Cutting-Off
Automatic Screw Threading
Wire Feed
Attachments

Automatic Screw Machines

THE Automatic Screw Machines are made in regular and high speed types, many sizes being suitable to, or equipped with, individual motor drive. They are arranged to take tools to perform a great variety of operations and accordingly are suitable for manufacturing a large variety of articles other than screws.

The operation of the machine is controlled by adjustable dogs mounted on dog carriers on the camshaft. These dogs govern the reversal of the spindle, change in speed, feeding of stock, and indexing of turret. The so-called idle movements of the machine are each independently operated and may be overlapped with each other or with the cutting operations. The turret slide and cross slide tools are advanced on the work by disk cams which control each slide independently and also permit them to operate simultaneously. This feature combined with the overlapping of idle operations enables the total time for making a piece to be reduced to a minimum.

The speed of the camshaft is controlled by change gears driven from the driving shaft of the machine. The driving shaft is driven independently by belt and runs at constant speed, thereby permitting each idle movement to be rapidly performed regardless of the time required to complete the piece.

The spindle is arranged with two loose pulleys mounted on roller bearings and engaged by a friction clutch. This clutch is operated automatically in the same manner as the other idle movements of the machine, enabling practically instantaneous reversal or change of speed.

Automatic lubrication is provided, on most of the machines, to the more important points.

Automatic Turret Forming Machines

The Automatic Turret Forming Machines are made in the regular and high speed types, many sizes being suitable for individual motor drive. They are similar to the Automatic Screw Machines except that they do not have a reversible spindle. Due to these machines not being as universal in operation as our Automatic Screw Machines they are particularly recommended for large installations where the work is not often changed.

Automatic Cutting-Off Machines

The Automatic Cutting-Off Machines are made in the regular and high speed, countershaft and motor drive types, and are similar to the machines already described except that the turret is replaced by a slide carrying a stock stop.

High Speed Machines

The High Speed Machines are designed for stepping up production in the free cutting materials and have much faster spindle speeds. The high

speed of the driving shaft enables the machines to perform idle movements in half the time allotted to the same movements on the regular machines.

Automatic Screw Threading Machines

These machines are designed particularly for high speed production of screws or other similar threaded parts requiring threading, forming, cutting-off and slotting operations. The driving shaft speed is the same as on our other high speed machines.

The non-reversing high speed spindle is provided with suitable speeds for producing from both steel and brass. The die spindle is arranged for much higher speeds, to enable the die to run on when both spindles are running in the same direction. The die is run off by stopping the die spindle. This arrangement for threading allows the work spindle to run continuously in the same direction, permitting overlapping of forming, threading and cutting-off operations.

These machines are also suitable for making studs, pins and other parts requiring forming and cutting-off operations only, at the same high production as the High Speed Machines

Motor Driven Machines

The Nos. 00G, 0G, 2G, 4 and 6 Automatic Screw Machines are equipped either for belt or motor drive. The Nos. 00G and 0G Machines have a cabinet type base enclosing the motor which is directly connected to the pulley drive shaft. The motor on the No. 2G Machine is mounted on a base between the left-hand legs and that on the Nos. 4 and 6 is placed in a compartment on the left of the machine. The drive is by belt.

"Motor drive only" machines are furnished only fitted "for" or "with" motors.

Wire Feed Screw Machines

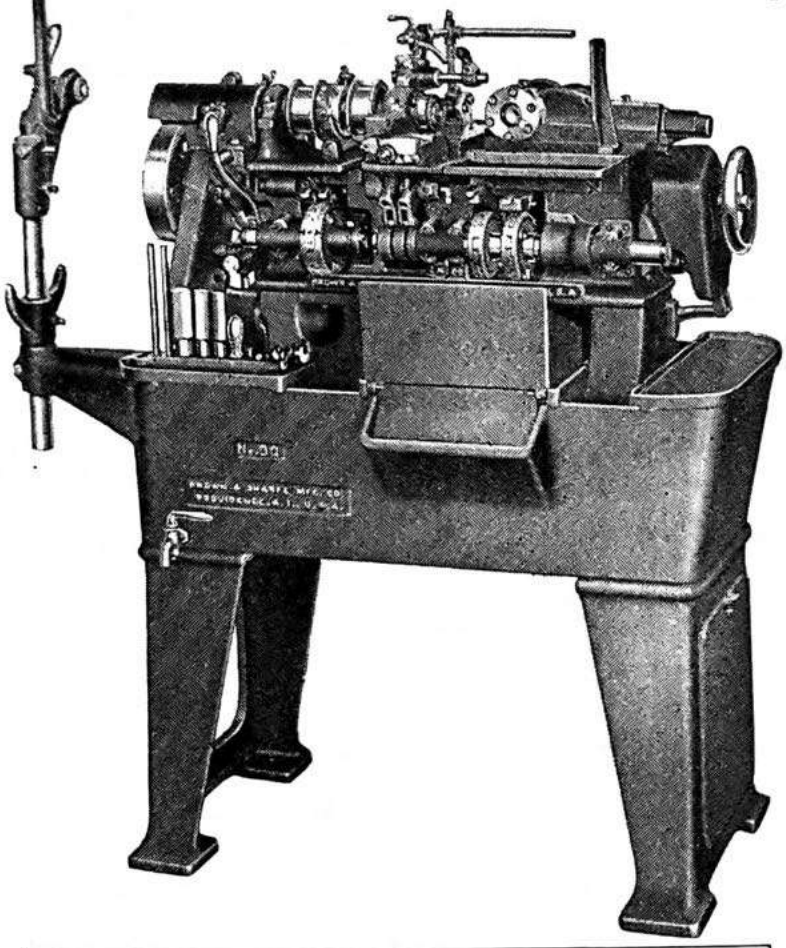
The automatic feeding and chuck operating mechanisms greatly reduce the labor of the operator and make the Wire Feed Screw Machines efficient in manufacturing all varieties of small parts directly from the bar where many or all of the operations of turning, drilling, threading and forming are to be performed. These machines can be quickly and cheaply set up for small quantities of work.

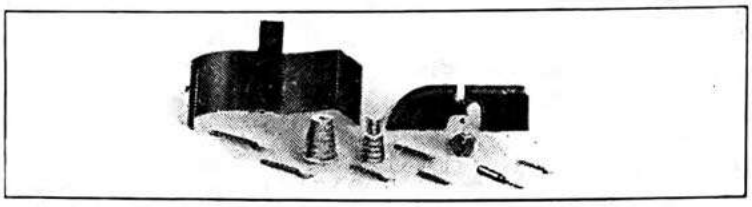
The Wire Feed Screw Machines are also made in a motor driven type. In these machines the different speeds are obtained from the motor together with a reduction mechanism permitting a slow speed to be obtained in conjunction with a faster one. This permits combinations of forming, drilling, threading and cutting-off operations to be performed at approximately correct surface speeds. The spindle reverse is the same as used on our Automatic Screw Machines except that it is operated by a hand lever.

No. 00 Automatic Screw Machine

No. 00 Automatic Screw Machine
High Speed

No. 00 Automatic Screw Machine
(High Speed) (With 30 Spindle Speeds)





Nos. 00 (High Speed) and 00 (High Speed) (With 30 Spindle Speeds) shown. No. 00 is similar in design to machine shown on page 186.

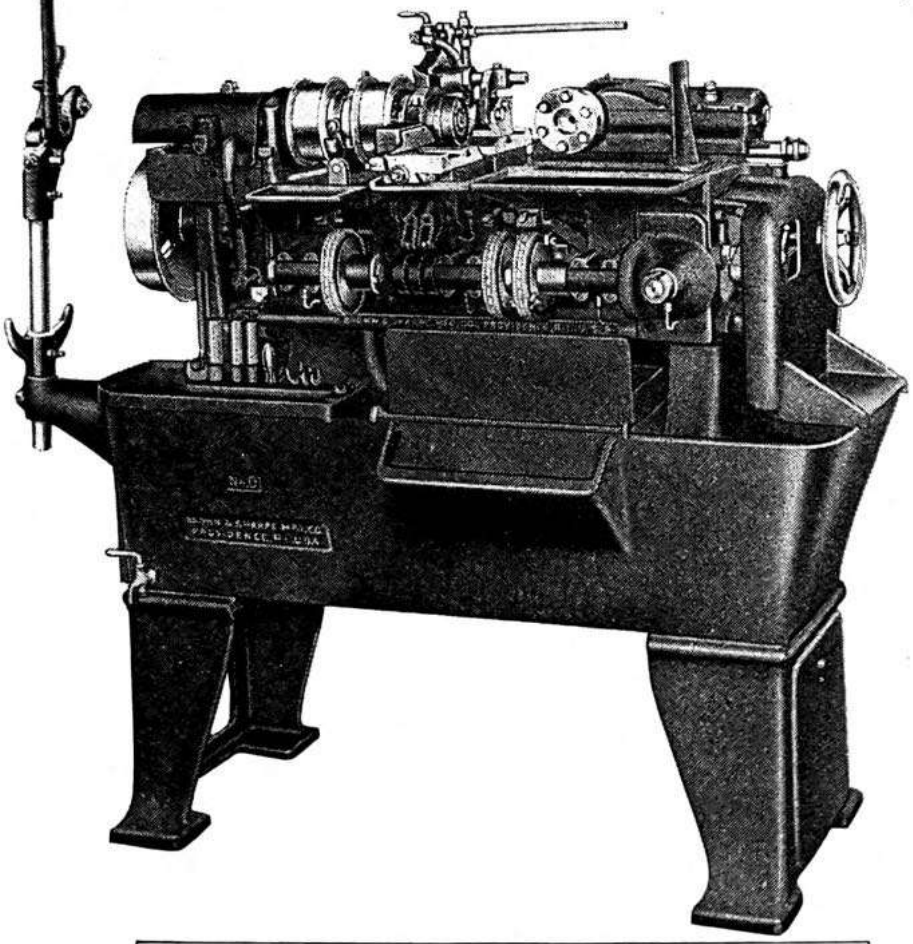
		No. 00	No. 00 (H.S.) No. 00 (H.S.) (30 Spds.)
Capacity	Hole through largest regular feeding finger	5/16″	5/16″
	Turns any length to	1 1/4″	3/4″
	Feeds any length to	2″	1″
	Power required	2 H.P.	2 H.P.

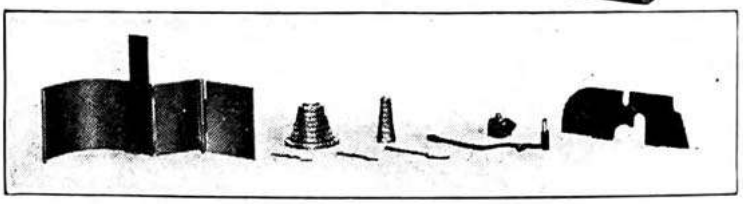
No. 00 Automatic Screw Machine
No. 00 Automatic Screw Machine (High Speed)
No. 00 Automatic Screw Machine (High Speed) (With 30 Spindle Speeds)

		No. 00	No. 00 (H.S.)	No. 00 (H.S.) (30 Spds.)
Capacity	Hole through largest regular feeding finger . . . . . .diam., inches	5/16	5/16	
	Hole through feed tube . .diam., in.	21/64	21/64	
	Hole through spindle .diam., inches	9/16	9/16	
	Turns any length to . . . . . .inches	1¼	¾	
	One movement of feeding mechanism feeds any length to . . . . . .inches	2	1	
	Distance, chuck to turret . . . . . Max. inches	2 15/16	2 15/16	
	Distance, chuck to turret . . . . . Min. inches	1 9/16	1⅞	
Drive	2 friction clutch pulleys . .diam., in.	4	3 1/16	3 1/16 and 4
	Belt width . . . . . .inches	1¼	1¼	1¼
Driving shaft speed . . . . . .r.p.m.		120	240	240
Spindle Speed	Number of changes	12	3	30
	Range in either direction . . .r.p.m.	420 to 2400	5000, 3600 and 1500	242 to 5000
	Ratio of forward and reverse speeds			1 to 3 and 1 to 5
	Not to be used together reversing . . . . . .r.p.m.		5000 and 3600	
Spring collet and feeding finger . . . . . .size, inches		5/16		
Taper nose spring collet and feeding finger . . . . . .size, inches			5/16	
Scale on feed slide graduated to 1/32" or Mm.				
Turret	Number of holes	6	6	
	Diameter of holes . . . . . .inches	⅝	⅝	
	Center of holes to slide . . . . .inches	⅞	⅞	
Production rate for one piece, per cycle of cams . . . . . .seconds		1½ to 91	¾ to 45½	
Countershaft	Pair tight and loose pulleys . . . . . .diam., inches	8	8	8 (2 frict. 2 loose)
	Belt width . . . . . .inches	3	3	3
	Speed . . . . . .r.p.m.	450	800	260 and 575
Floor Space	Right angles to spindle . . . . .inches	22	27	
	Parallel to spindle . . . . . .inches	40	46½	
Weights (Approx.)	Net — Machine . . . . . .lbs.	750	800	800
	Net — Countershaft . . . . . .lbs.	415	175	415
	Shipping — Machine . . . . . .lbs.	975	1025	1025
	Shipping — Countershaft (including wire stands) . . . . . .lbs.	580	335	580
Equipment	Pump and piping, set of cam blanks, change gears, extra nut to take regular collet (High Speed Machines only), 2 wire stands and countershaft.			
Furnished as Extra—				
Feed Tube	For light work to . . . .diam., inches	⅜	⅜	
Spindle	For light work to . . . .diam., inches (In place of regular spindle)	7/16	7/16	

Turning capacity of 1¼", with one movement of feeding mechanism feeding any length to 2", at 120 r.p.m. driving shaft speed. (On High Speed Machines only.)

No. 0 Automatic Screw Machine
No. 0 Automatic Screw Machine
High Speed
No. 0 Automatic Screw Machine
(High Speed) (With 30 Spindle Speeds)





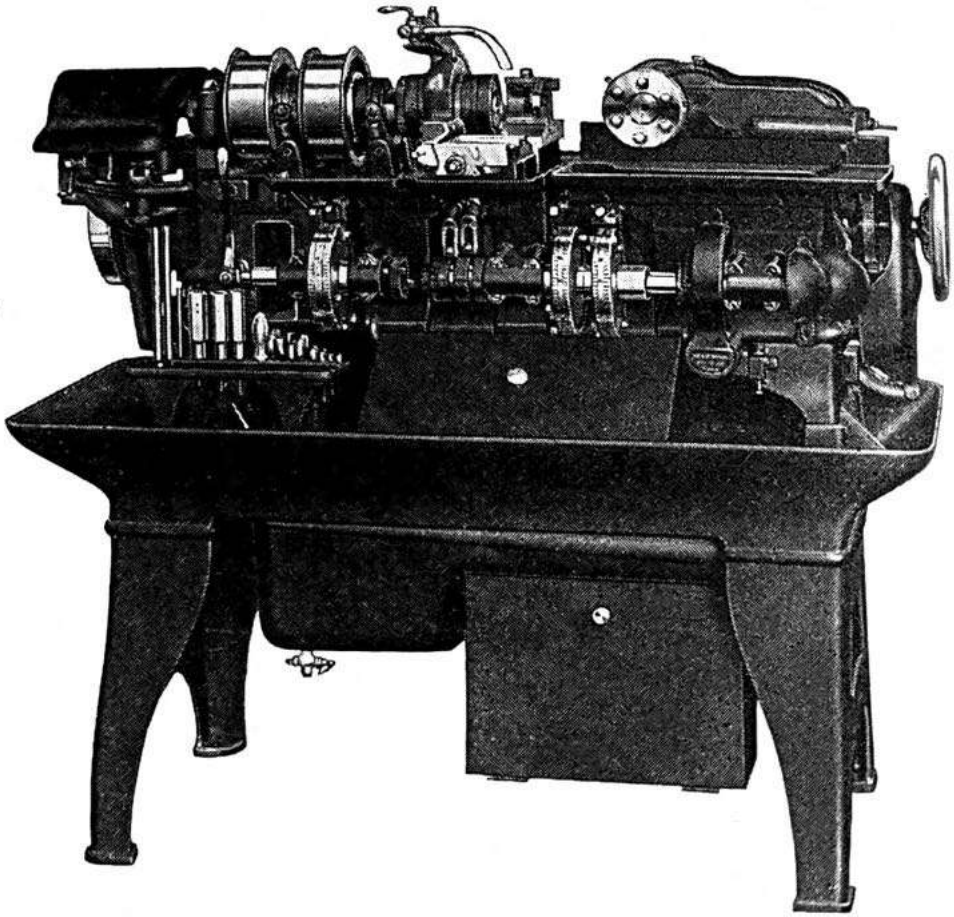
No. 0 High Speed and No. 0 (High Speed) (With 30 Spindle Speeds) shown. No. 0 is similar in design to machine shown on page 188.

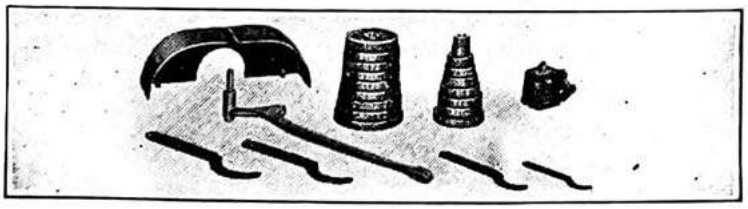
		No. 0	No. 0 (H.S.) No. 0 (H.S.) (30 Spds.)
Capacity	Hole through largest regular feeding finger	1/2″	1/2″
	Turns any length to	2″	1 1/4″
	Feeds any length to	3″	2″
	Power required	2 H.P.	2 H.P.

No. 0 Automatic Screw Machine
No. 0 Automatic Screw Machine (High Speed)
No. 0 Automatic Screw Machine
(High Speed) (With 30 Spindle Speeds)

		No. 0	No. 0 (H.S.)	No. 0 (H.S.) (30 Spds.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	1/2	1/2	
	Hole through feed tube . diam., in.	17/32	17/32	
	Hole through spindle . diam., inches	7/8	7/8	
	Turns any length to . . . . . inches	2	1 1/4	
	One movement of feeding mechanism feeds any length to . . . . . inches	3	2	
	Distance, chuck to turret . . . . . Max. inches	5 1/8	5 1/8	
	Distance, chuck to turret . . . . . Min. inches	2 1/8	2 3/8	
Drive	2 friction clutch pulleys . . diam., in.	6	5	5 and 6
	Belt width . . . . . inches	2	2	2
Driving shaft speed . . . . . r.p.m.		180	180	180
Spindle Speed	Number of changes	12	3	30
	Range in either direction . . . . r.p.m.	200 to 1800	3600, 2700 and 1200	175 to 3600
	Ratio of forward and reverse speeds	2 1/4 to 1		1 to 3 and 1 to 5
	Not to be used together reversing . . . . . r.p.m.		3600 and 2700	
Spring collet and feeding finger . . . . . size, inches		1/2		
Taper nose spring collet and feeding finger . . . . . size, inches			1/2	
Scale on feed slide graduated to 1/32" or Mm.				
Turret	Number of holes	6	6	
	Diameter of holes . . . . . inches	3/4	3/4	
	Center of holes to slide . . . . . inches	1 3/8	1 3/8	
Production rate for one piece, per cycle of cams . . . . . seconds		3 1/3 to 353	1 2/3 to 176 1/2	
Countershaft	Pair tight and loose pulleys . . . . . diam., inches		8	8 (2 Pair)
	2 friction and 2 loose pulleys . . . . . diam., inches	10		
	Belt width . . . . . inches	3	3	3
	Speed . . . . . r.p.m.	170 and 377	740	245 and 540
Floor Space	Right angles to spindle . . . . . inches	25	23	
	Parallel to spindle . . . . . inches	51	50 1/2	
Weights (Approx.)	Net: Machine . . . . . lbs.	1225	1275	1275
	Net: Countershaft . . . . . lbs.	600	255	475
	Shipping: Machine (including wire stands) . . . . . lbs.	1625	1675	1675
	Shipping: Countershaft . . . . . lbs.	750	390	625
Equipment	Pump and piping, change gears, set of cam blanks, extra nut to take regular collet (High Speed Machines only), 2 wire stands and countershaft.			
Furnished as Extra—				
Feed Tube	For light work to . . . . diam., inches	5/8	5/8	
Turning capacity of 2", with one movement of feeding mechanism feeding any length to 3", at 120 r.p.m. driving shaft speed. (On High Speed Machines only.)				

No. 2 Automatic Screw Machine
No. 2 Automatic Screw Machine
High Speed
No. 2 Automatic Screw Machine
(High Speed) (With 30 Spindle Speeds)





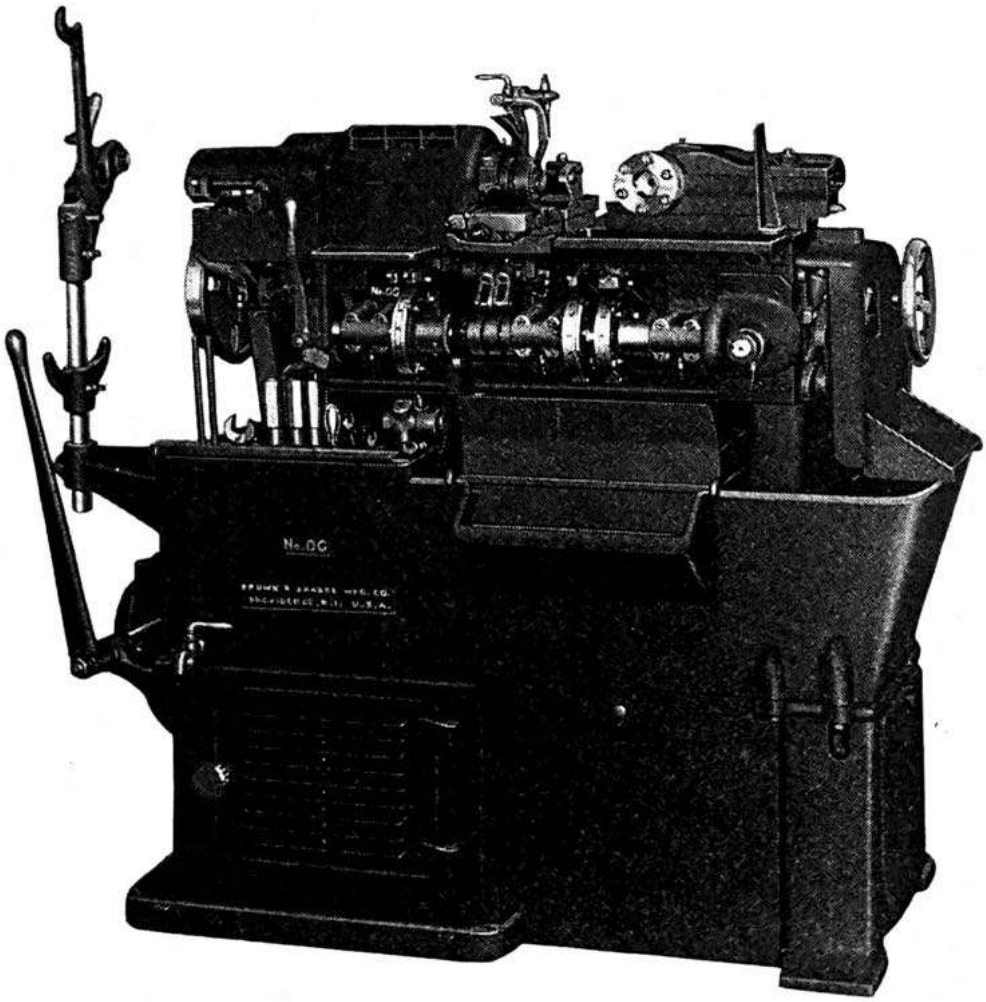
No. 2 shown

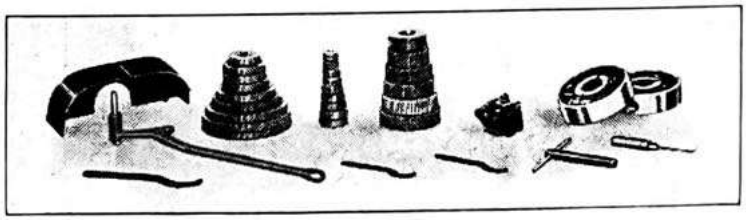
		No. 2	No. 2 (H.S.) No. 2 (H.S.) (30 Spds.)
Capacity	Hole through largest regular feeding finger	1″	1″
	Turns any length to	3″	2″
	Feeds any length to	4″	2½″
	Power required	3 H.P.	3 H.P.

No. 2 Automatic Screw Machine
No. 2 Automatic Screw Machine (High Speed)
No. 2 Automatic Screw Machine (High Speed) (With 30 Spindle Speeds)

		No. 2	No. 2 (H.S.)	No. 2(H.S.) (30 Spds.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	1	1	
	Hole through feed tube . . diam., in.	1 1/32	1 1/32	
	Hole through spindle . diam., inches	1 7/16	1 7/16	
	Turns any length to . . . . . inches	3	2	
	One movement of feeding mechanism feeds any length to . . . . . inches	4	2 1/2	
	Distance, chuck to turret . . . . . Max. inches	6 3/4	6 3/4	
	Distance, chuck to turret . . . . . Min. inches	2 1/2	2 1/2	
Drive	2 friction clutch pulleys . . diam., in.	7	6 1/4	6 1/4 and 7
	Belt width . . . . . inches	2 1/2	2 1/2	2 1/2
Driving shaft speed . . . . . r.p.m.		120	240	240
Spindle Speed	Number of changes	12	3	30
	Range in either direction . . . r.p.m.	120 to 1200	2400, 1800 and 900	125 to 2400
	Ratio of forward and reverse speeds	2 1/4 to 1		1 to 3 and 1 to 5
	Not to be used together reversing . . . . . r.p.m.		2400 and 1800	
Spring collet and feeding finger . . . . . size, inches		7/8	7/8	
Scale on feed slide graduated to 1/32" or Mm.				
Turret	Number of holes	6	6	
	Diameter of holes . . . . . inches	1	1	
	Center of holes to slide . . . . . inches	1 1/2	1 1/2	
Production rate for one piece, per cycle of cams . . . . . seconds		6 to 480	3 to 240	
Countershaft	Pair tight and loose pulleys . . . . . diam., inches		12	12 (2 Pair)
	2 friction and 2 loose pulleys . . . . . diam., inches	12		
	Belt width . . . . . inches	3 1/2	3 1/2	3 1/2
	Speed . . . . . r.p.m.	149 and 343	635	240 and 540
Floor Space	Right angles to spindle . . . . . inches	26	26	
	Parallel to spindle . . . . . inches	60	60	
Weights (Approx.)	Net: Machine . . . . . lbs.	1775	1775	1775
	Net: Countershaft . . . . . lbs.	825	300	725
	Shipping: Machine (including wire stands) . . . . . lbs.	2300	2300	2300
	Shipping: Countershaft . . . . . lbs.	1050	450	910
Equipment	Pump and piping, change gears, set of cam blanks, 2 wire stands, and countershaft.			
Furnished as Extra—				
Feed Tube	For light work to . . . . diam., inches	1 1/8	1 1/8	
Turning capacity of 3", with one movement of feeding mechanism feeding any length to 4", at 120 r.p.m. driving shaft speed. (On High Speed Machines only.)				

Nos. 00G and 0G
Automatic Screw Machines





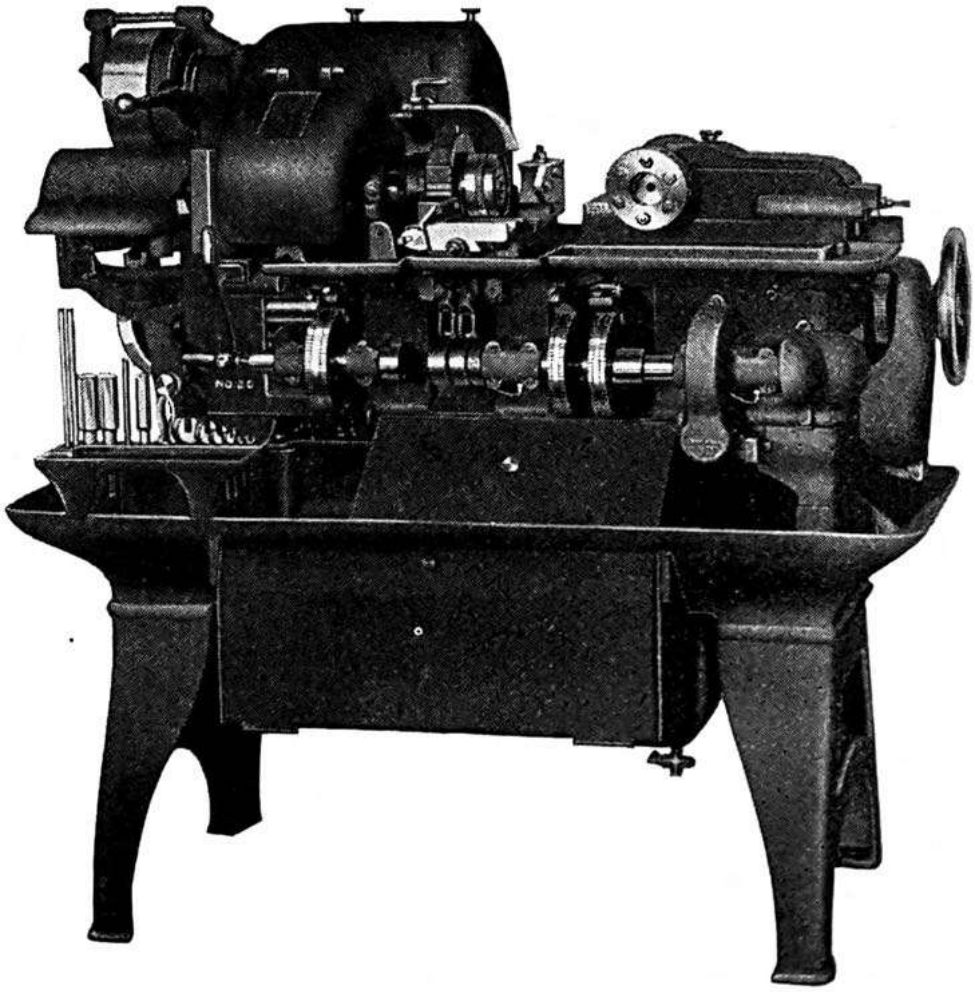
No. 0G shown

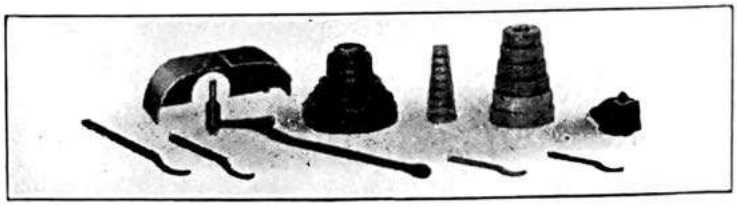
		No. 00G	No. 0G
Capacity	Hole through largest regular feeding finger	5/16″	1/2″
	Turns any length to	1 1/4″	2″
	Feeds any length to	2″	3″
	Power required	2 H.P.	3 H.P.

Nos. 00G and 0G Automatic Screw Machines

			No. 00G	No. 0G
Capacity		Hole through largest regular feeding finger . . . . . diam., inches	5/16	1/2
		Hole through feed tube . . diam., inches	21/64	17/32
		Hole through spindle . . . . diam., inches	9/16	7/8
		Turns any length to . . . . . inches	1 1/4	2
		One movement of feeding mechanism feeds any length to . . . . . inches	2	3
		Distance, chuck to turret { Max. inches	2 15/16	5 1/8
		Distance, chuck to turret { Min. inches	1 9/16	2 1/8
Drive	Motor	Friction clutch sprocket . . diam., inches	8 3/4	8 3/4
	Over-head	Friction clutch pulley . . . { diam., inches	8	9
		Friction clutch pulley . . . { speed, r.p.m.	400	400
		Belt width . . . . . inches	3	3 1/2
Driving shaft speed . . . . . r.p.m.			120	180
Spindle Speed		Number of changes	15	12
		Range . . . . . r.p.m.	260 to 2120	200 to 1800
		Ratio of forward and reverse speeds	2 1/2 to 1	2 1/4 to 1
Spring collet and feeding finger . . . . . size, inches			5/16	1/2
Scale on feed slide graduated to 1/32" or Mm.				
Turret		Number of holes	6	6
		Diameter of holes . . . . . inches	5/8	3/4
		Center of holes to slide . . . . . inches	7/8	1 3/8
Production rate for one piece, per cycle of cams . . . . . seconds			1 1/2 to 91	3 1/3 to 353
Floor Space		Right angles to spindle . . . . . inches	27	28 1/4
		Parallel to spindle . . . . . inches	49	62
Weights (Approx.)	Net	{ Belt drive . . . . . lbs.	1575	2100
	Net	{ Fitted for motor . . . . . lbs.	1675	2300
	Net	{ Fitted with motor . . . . . lbs.	1800	2400
	Ship-ping	{ Belt drive . . . . . lbs.	2000	2650
	Ship-ping	{ Fitted for motor . . . . . lbs.	2100	2850
	Ship-ping	{ Fitted with motor . . . . . lbs.	2225	2950
Equipment		Pump and piping, change gears, split pulleys, set of cam blanks and 2 wire stands.		
		Furnished as Extra—		
Feed Tube		For light work to . . . . . diam., inches	3/8	5/8
Countershaft		Pair tight and loose pulleys . . . . . diam., inches	10	10
		Belt width . . . . . inches	3 1/2	3 1/2
		Speed . . . . . r.p.m.	400	450
		Net Weight . . . . . lbs.	160	165
		Provided with attachment driving pulley.		
Spindle		For light work to . . . . . diam., inches (In place of regular spindle)	7/16	

No. 2G
Automatic Screw Machine



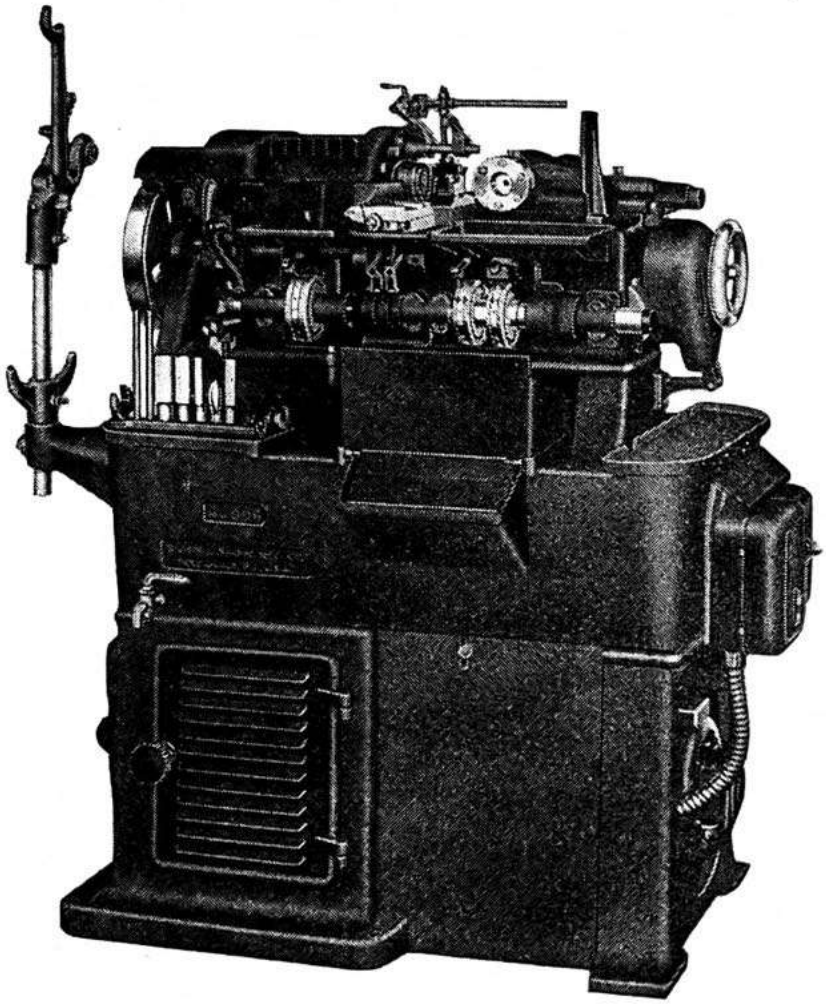


Capacity	Hole through largest regular feeding finger....	1″
	Turns any length to.....	3″
	Feeds any length to.....	4″
	Power required.....	3 H.P.

No. 2G Automatic Screw Machine

Capacity		Hole through largest regular feeding finger diam., inches	1
		Hole through feed tube . . . . diam., inches	1 1/32
		Hole through spindle . . . . diam., inches	1 7/16
		Turns any length to . . . . inches	3
		One movement of feeding mechanism feeds any length to . . . . inches	4
		Distance, chuck to turret . . . . Max. inches	6 3/4
		Distance, chuck to turret . . . . Min. inches	2 1/2
Drive	Motor	Friction clutch pulley . . . . diam., inches	11 1/2
		Friction clutch pulley . . . . speed, r.p.m.	720
	Over-head	Friction clutch pulley . . . . diam., inches	9
		Friction clutch pulley . . . . speed, r.p.m.	360
		Belt width . . . . inches	3
Driving shaft speed . . . . r.p.m.			120
Spindle Speed		Number of changes	12
		Range . . . . r.p.m.	119 to 1216
		Ratio of forward and reverse speeds	2 1/4 to 1
Spring collet and feeding finger . . . . size, inches			7/8
Scale on feed slide graduated to 1/32" or Mm.			
Turret		Number of holes	6
		Diameter of holes . . . . inches	1
		Center of holes to slide . . . . inches	1 1/2
Production rate for one piece, per cycle of cams . . . . seconds			6 to 480
Floor Space		Right angles to spindle . . . . inches	28
		Parallel to spindle . . . . inches	62
Weights (Approx.)	Net	Belt drive . . . . lbs.	2125
		Fitted for motor . . . . lbs.	2325
		Fitted with motor . . . . lbs.	2500
	Ship-ping	Belt drive . . . . lbs.	2700
		Fitted for motor . . . . lbs.	3000
		Fitted with motor . . . . lbs.	3100
Equipment		Pump and piping, set of cam blanks, 2 wire stands and everything else shown in cuts.	
Furnished as Extra—			
Feed Tube		For light work to . . . . diam., inches	1 1/8
Countershaft		Pair tight and loose pulleys . . . . diam., inches	12
		Belt width . . . . inches	3 1/2
		Speed . . . . r.p.m.	325
		Net Weight . . . . lbs.	225
		Provided with attachment driving pulley.	

Nos. 00G, 0G and 2G
Automatic Screw Machines
(High Speed) (For Motor Drive Only)



No. 00G shown

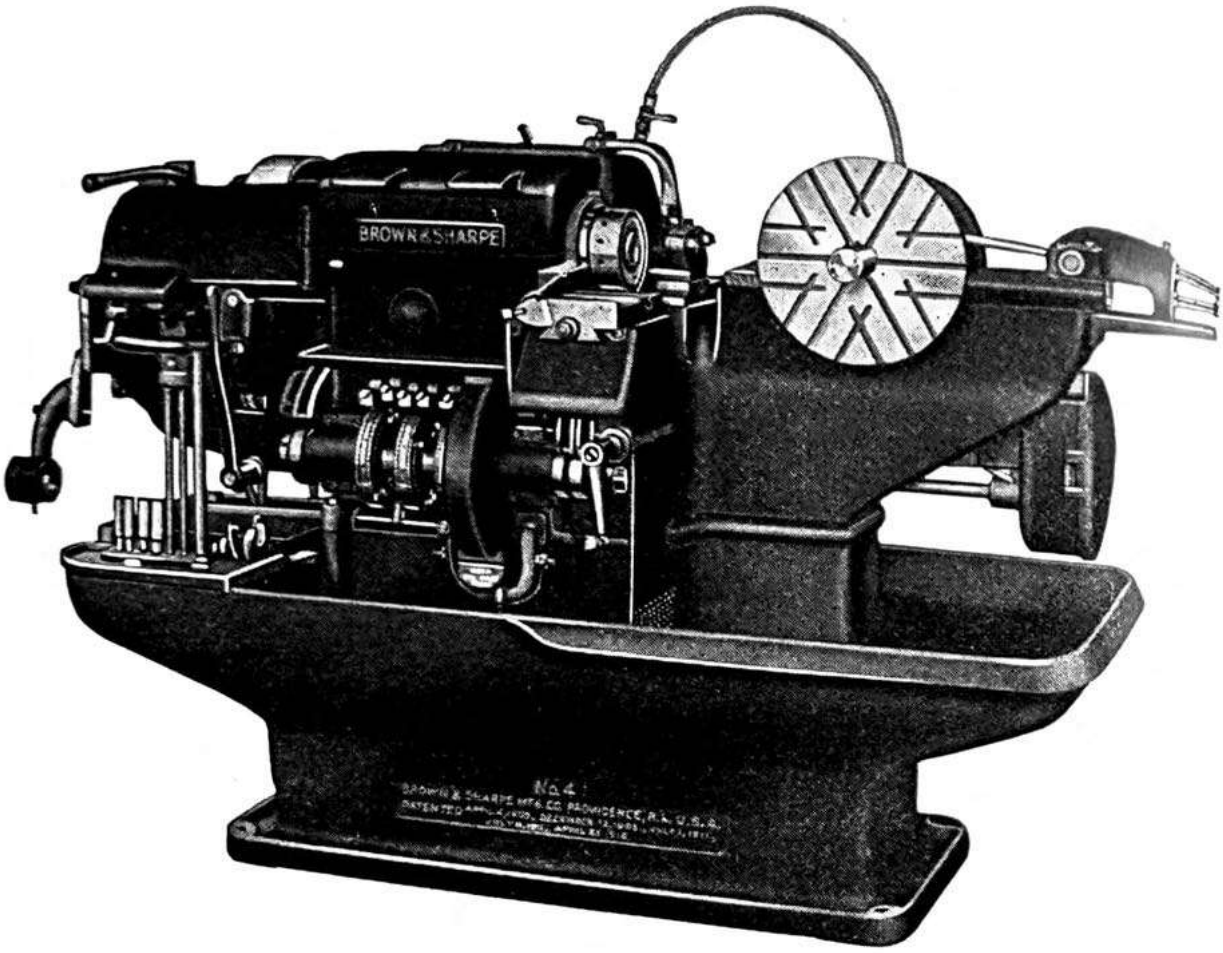
		No. 00G	No. 0G	No. 2G
Capacity	Hole through largest regular feeding finger	5/16″	1/2″	1″
	Turns any length to	3/4″	1 1/4″	2″
	Feeds any length to	1″	2″	2 1/2″
	Power required	2 H.P.	3 H.P.	5 H.P.

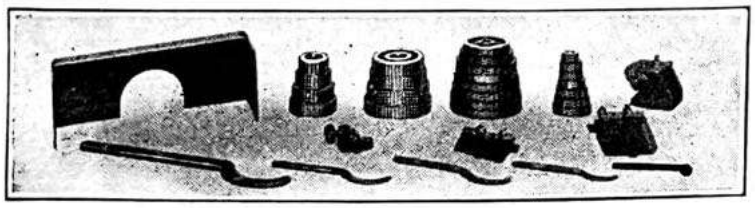
Nos. 00G, 0G and 2G Automatic Screw Machines
(High Speed) (For Motor Drive Only)

		No. 00G	No. 0G	No. 2G
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	5/16	1/2	1
	Hole through feed tube . . . . . diam., inches	21/64	17/32	1 1/32
	Hole through spindle . diam., inches	9/16	7/8	1 7/16
	Turns any length to . . . . . inches	3/4	1 1/4	2
	One movement of feeding mechanism feeds any length to . . . inches	1	2	2 1/2
	Distance, chuck to turret . . . . . Max. inches	2 15/16	5 1/8	6 3/4
	Distance, chuck to turret . . . . . Min. inches	1 7/8	2 3/8	2 1/2
Drive	Motor connected direct to main driving shaft. Motor speed . . . . . r.p.m.	1800	1800	1800
Driving shaft speed . . . . . r.p.m.		240	180	240
Spindle Speed	Number of changes	30	30	30
	Range in either direction . . . . r.p.m.	243 to 5000	177 to 3600	125 to 2400
	Ratio of forward and reverse speeds	1 to 3 and 1 to 5	1 to 3 and 1 to 5	1 to 3 and 1 to 5
Spring collet and feeding finger . . . . . size, inches		5/16	1/2	7/8
Scale on feed slide graduated to 1/32" or Mm.				
Turret	Number of holes	6	6	6
	Diameter of holes . . . . . inches	5/8	3/4	1
	Center of holes to slide . . . . . inches	7/8	1 3/8	1 1/2
Production rate for one piece, per cycle of cams . . . . . seconds		3/4 to 45 1/2	1 2/3 to 176 1/2	3 to 240
Floor Space	Right angles to spindle . . . . . inches	29 1/2	29	31
	Parallel to spindle . . . . . inches	46	59	61
Weights (Approx.)	Net . . . . . Fitted for motor . . . . . lbs.	1500	1975	2550
	Net . . . . . Fitted with motor . . . . . lbs.	1600	2075	2650
	Shipping . . . . . Fitted for motor . . . . . lbs.	1900	2525	3075
	Shipping . . . . . Fitted with motor . . . . . lbs.	2000	2625	3175
Equipment	Pump and piping, extra nut to take regular collet (on Nos. 00G and 0G), spindle driving belts, change gears, set of cam blanks, 2 wire stands and grease gun for lubricating bearings.			
Furnished as Extra—				
Feed Tube	For light work to . . . . diam., inches	3/8	5/8	1 1/8
Spindle	For light work to . . . . diam., inches (In place of regular spindle.)	7/16		

Turning capacity of 1 1/4" on No. 00G, 2" on No. 0G, 3" on No. 2G, with one movement of feeding mechanism feeding any length to 2" on No. 00G, 3" on No. 0G, 4" on No. 2G, at 120 r.p.m. driving shaft speed.

Nos. 4 and 6
Automatic Screw Machines





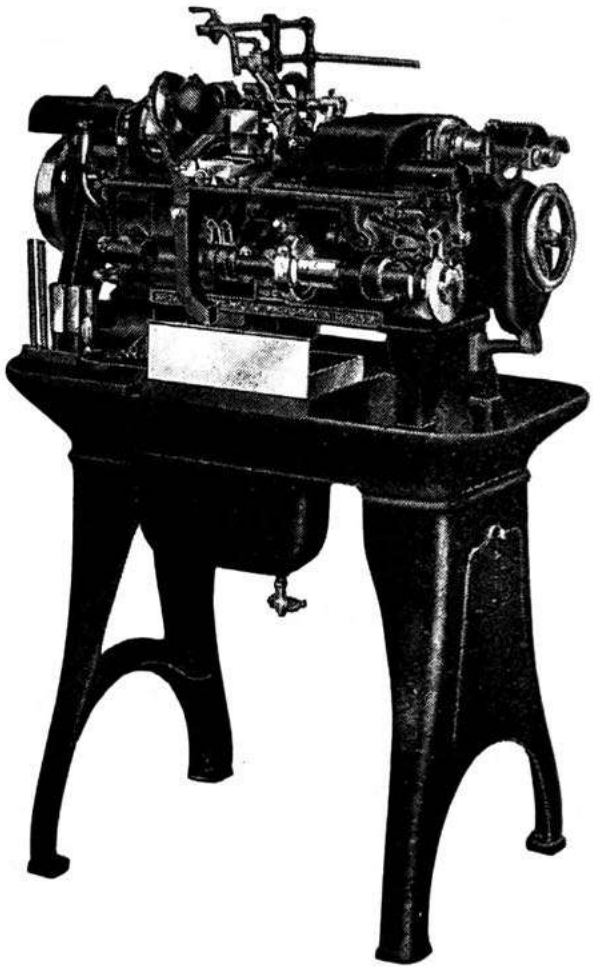
No. 4 shown

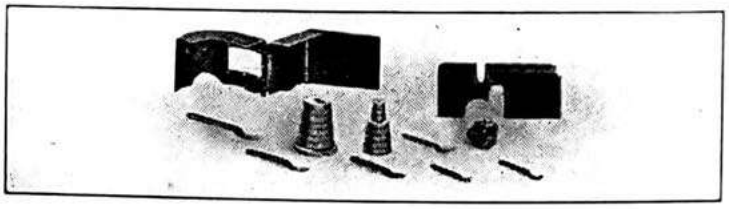
		No. 4	No. 6
Capacity	Hole through largest regular feeding finger	1½″	2″
	Turns any length to	4″	5″
	Feeds any length to	5″	6″
	Power required	5 H.P.	7½ H.P.

Nos. 4 and 6 Automatic Screw Machines

			No. 4	No. 6
Capacity		Hole through largest regular inside feeding finger . . . . diam., inches	1½	2
		Hole through largest regular outside feeding finger . . . . . diam., inches	1⅞	2⅜
		Hole through feed tube . . diam., inches	1⅝	2⅛
		Hole through spindle . . . . diam., inches	2	2½
		Turns any length to . . . . . inches	4	5
		One movement of feeding mechanism feeds any length to . . . . . inches	5	6
		Distance, chuck to turret — Max. inches	6⅞	8⅝
		Distance, chuck to turret — Min. inches	2⅞	3⅝
Drive	Motor	Friction clutch pulley . . — diam., inches	10½	12
		Friction clutch pulley — speed, r.p.m.	630	630
	Overhead	Friction clutch pulley . . . . diam., inches	10½	12
		Driving pulley speed — For Steel r.p.m.	340	315
		Driving pulley speed — For Brass r.p.m.	660	671
		Belt width . . . . . inches	3½	4
Driving shaft speed . . . . . r.p.m.			120	90
Spdle. Speed	Motor Drive	Number of changes	17	17
		Range — Forward . . . . . r.p.m.	70 to 610	48 to 502
		Range — Backward . . . . . r.p.m.	115 to 1000	80 to 875
	Overhead Drive	For Steel — Number of changes	17	17
		For Steel — Range — Forward . . . . . r.p.m.	70 to 610	48 to 502
		For Steel — Range — Backward . . . . . r.p.m.	115 to 1000	80 to 875
		For Brass — Number of changes	13	13
		For Brass — Range — Forward . . . . . r.p.m.	136 to 608	102 to 500
		For Brass — Range — Backward . . . . . r.p.m.	224 to 1000	174 to 870
Collets		Master collet takes sets of 3 pads for all sizes of stock to . . . . diam., inches	1½	2
		One-piece collet for stock . . diam., inches	1½ to 1⅞	2 to 2⅜
Cross Slides		Transverse movement . . . . . inches	2¼	2½
Scale on feed slide graduated to 1/16″ or Mm.				
Feeding Mechanism		Master feed finger takes sets of 3 pads for all sizes of stock to . . diam., in.	1¼	1¾
		One-piece fingers for stock . . diam., in.	1¼ to 1½	1¾ to 2
		Master outside feed finger takes sets of 4 pads for all sizes stock. diam., in.	1½ to 1⅞	2 to 2⅜
Turret		Diameter . . . . . inches	13	15
Production rate for one piece per cycle of cams . seconds			12 to 800	20 to 1200
Floor Space		Right angles to spindle . . . . . inches	52	54
		Parallel to spindle . . . . . inches	90	98
Weights (Approx.)		Net — Belt drive . . . . . lbs.	4450	5650
		Net — Fitted for motor . . . . . lbs.	4700	5825
		Net — Fitted with motor . . . . . lbs.	4925	6225
		Shipping — Belt drive . . . . . lbs.	5100	6350
		Shipping — Fitted for motor . . . . . lbs.	5400	6475
		Shipping — Fitted with motor . . . . . lbs.	5650	6875
Equipment		Pump and piping, master spring collet and master feeding finger with pads, outside master feeding finger with pads, outside feeding attachment, set of cam blanks, change gears, and 2 wire stands.		
Furnished as Extra—				
Countershaft		One pair of tight and loose pulleys . . . . . diam., inches	14	14
		Belt width . . . . . inches	4	4½
		Speed . . . . . r.p.m.	300 or 570	315 or 671
		Net Weight . . . . . lbs.	200	215

No. 00
Automatic Screw Threading Machine
High Speed





Capacity	Hole through largest regular feeding finger	5/16″
	Feeds any length to	1″
	Power required	1½ H.P.

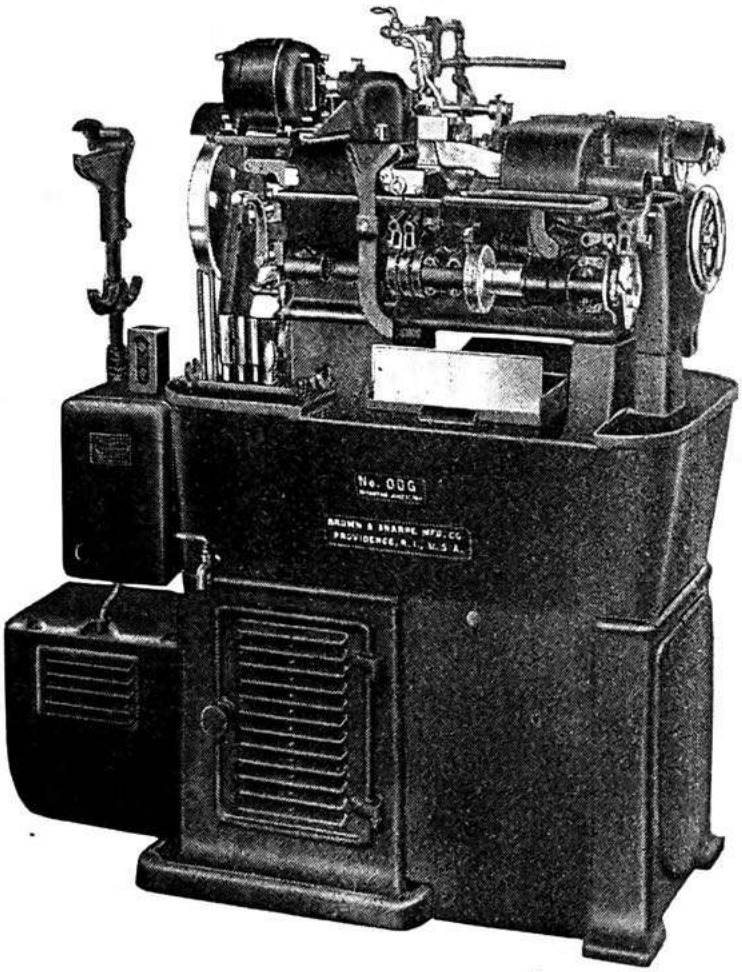
No. 00 Automatic Screw Threading Machine
High Speed

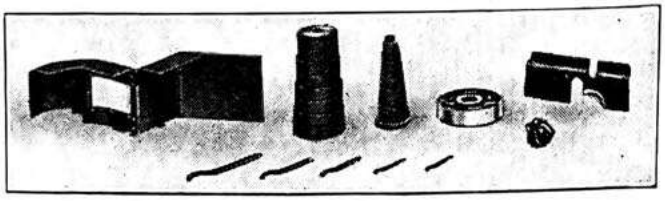
Capacity	Hole through largest regular feeding finger . . . . diam., inches	5/16
	Hole through feed tube . . . . diam., inches	21/64
	Hole through spindle . . . . diam., inches	3/16
	One movement of feeding mechanism feeds any length to . . . . inches	1
	Front of chuck to face of die { Max. . . . . inches	3
	Front of chuck to face of die { Min. . . . . inches	3/16
	Die spindle takes dies or small collet (3/16″ capacity).	
Driving shaft speed . . . . . r.p.m.		240
Drive	Work Spindle { 2 stepped cone pulley . . . . largest diam., in.	4 1/8
	Work Spindle { Belt width . . . . . inches	1 1/4
	Die Spindle { Single pulley . . . . diam., inches	2 1/2
	Die Spindle { Belt width . . . . . inches	1 1/4
Speeds	Work Spindle { Number of changes	20
	Work Spindle { Range . . . . . r.p.m.	850 to 5000
	Die Spindle { Number of changes	20
	Die Spindle { Range . . . . . r.p.m.	1450 to 7000
Threading Speed	Number of changes	30
	Range . . . . . r.p.m.	238 to 3500
	Ratios of thread cutting to turning speeds	1 to 1, 1 to 2 1/2 and 1 to 5
Taper nose spring collet and feeding finger . . . . . size, inches		5/16
Scale on feed slide graduated to 1/32″ or Mm.		
Screw Slotting Arrangement	Slots screws or similar pieces within the capacity of the machine.	
	Saw { Outside diameter . . . . . inches	1 3/4
	Saw { Hole . . . . . diam., inches	5/8
	Driving pulley diameter . . . . . inches	3 1/2
	Round belt diameter . . . . . inches	3/8
Production rate for one piece, per cycle of cams . . . . . seconds		3/4 to 20
Countershaft	Two pair of tight and loose pulleys . . . . . diam., inches	8
	Belt width . . . . . inches	3
	Speeds . . . . . r.p.m.	260 and 570
Floor Space	Right angles to spindle . . . . . inches	22
	Parallel to spindle . . . . . inches	40 1/2
Weights (Approx.)	Net { Machine . . . . . lbs.	790
	Net { Countershaft . . . . . lbs.	500
	Shipping { Machine . . . . . lbs.	1025
	Shipping { Countershaft (including wire stands) . . . . . lbs.	725
Equipment	Pump and piping, extra nut to take regular collet, change gears, set of cam blanks, countershaft, wire stands and everything else shown in cuts.	
	Furnished as Extra—	
Feed Tube	For light work to . . . . . diam., inches	3/8
Spindle	For light work to . . . . . diam., inches (In place of regular spindle)	7/16

No. 00G

Automatic Screw Threading Machine

(High Speed) (For Motor Drive)





Capacity	Hole through largest regular feeding finger	5/16″
	Feeds any length to	1″
	Power required	2 H.P.

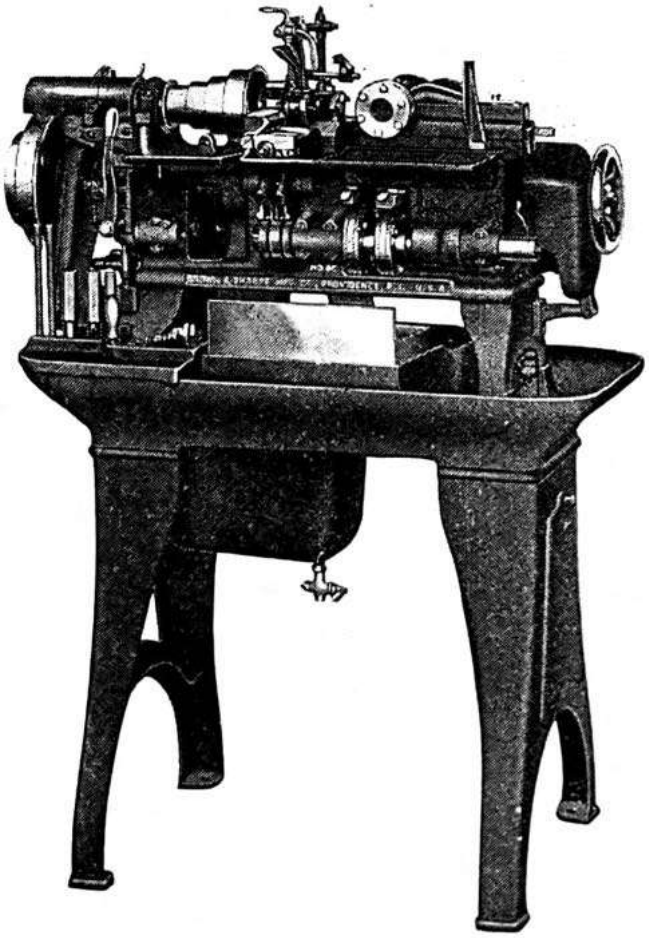
No. 00G Automatic Screw Threading Machine
(High Speed) (For Motor Drive)

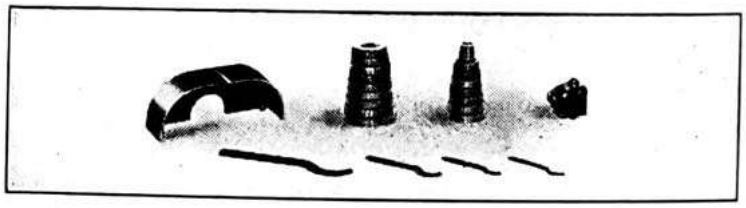
Capacity	Hole through largest regular feeding finger . . . . diam., inches	5/16
	Hole through feed tube . . . . diam., inches	21/64
	Hole through spindle . . . . diam., inches	9/16
	One movement of feeding mechanism feeds any length to . . . . inches	1
	Distance, front of chuck to face of die { Max. . . . inches	2 7/8
	Distance, front of chuck to face of die { Min. . . . inches	1/8
	Die spindle takes Acorn dies or small collet (3/16" capacity).	
Driving shaft speed . . . . r.p.m.		240
Drive	Work Spindle { 2 stepped cone pulley . . . . largest diam., in.	3 29/32
	Work Spindle { Belt width . . . . inches	1 1/4
	Die Spindle { Single pulley . . . . diam., inches	2 1/2
	Die Spindle { Belt width . . . . inches	1 1/4
Speeds	Work Spindle { Number of changes	20
	Work Spindle { Range . . . . r.p.m.	850 to 5000
	Die Spindle { Number of changes	20
	Die Spindle { Range . . . . r.p.m.	1455 to 7000
Threading Speed	Number of changes	30
	Range . . . . r.p.m.	240 to 3500
	Ratios of thread-cutting to turning speeds	1 to 1, 1 to 2 1/2, 1 to 5
Taper nose spring collet and feeding finger . . . . size, inches		5/16
Scale on feed slide graduated to 1/32" or Mm.		
Screw Slotting Arrangement	Slots screws or similar pieces within the capacity of the machine.	
	Driven by individual motor.	
	Saw { Outside diameter . . . . inches	1 3/4
	Saw { Hole . . . . diam., inches	5/8
Production rate for one piece, per cycle of cams . . . . seconds		3/4 to 20
Floor Space	Right angles to spindle . . . . inches	31
	Parallel to spindle . . . . inches	51 1/2
Weights (Approx.)	Net { Fitted for motor . . . . lbs.	1575
	Net { Fitted with motor . . . . lbs.	1700
	Shipping { Fitted for motor . . . . lbs.	2025
	Shipping { Fitted with motor . . . . lbs.	2150
Equipment	Pump and piping, extra nut to take regular collet, change gears, set of cam blanks, wire stands and everything else shown in cuts.	
	Furnished as Extra—	
Feed Tube	For light work to . . . . diam., inches	3/8
Spindle	For light work to . . . . diam., inches (In place of regular spindle)	7/16

No. 00 Automatic Turret Forming Machine

No. 00 Automatic Turret Forming Machine

High Speed





No. 00 shown. No. 00 High Speed is similar in design to machine shown on page 168.

		No. 00	No. 00 (H.S.)
Capacity	Hole through largest regular feeding finger	5/16″	5/16″
	Turns any length to	1¼″	¾″
	Feeds any length to	2″	1″
	Power required	1½ H.P.	1½ H.P.

No. 00 Automatic Turret Forming Machine

No. 00 Automatic Turret Forming Machine (High Speed)

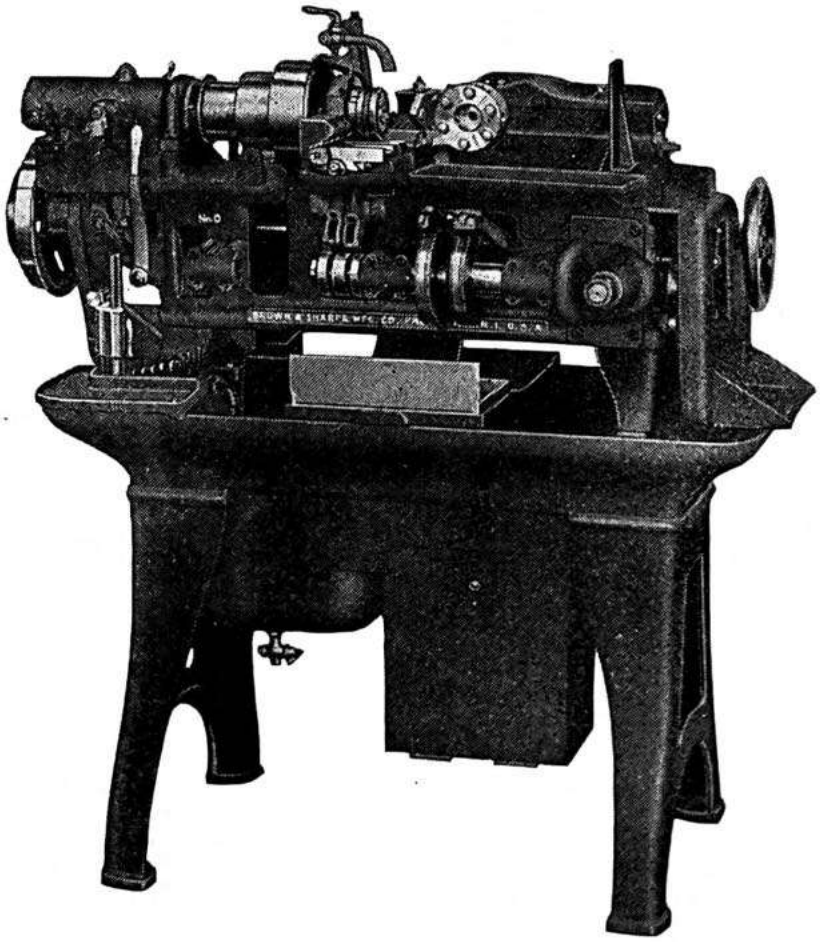
		No. 00	No. 00 (H.S.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	5/16	5/16
	Hole through feed tube . . diam., inches	21/64	21/64
	Hole through spindle . . . . diam., inches	9/16	9/16
	Turns any length to . . . . . inches	1¼	¾
	One movement of feeding mechanism feeds any length to . . . . . inches	2	1
	Distance, chuck to turret { Max. inches	2 15/16	2 15/16
	Distance, chuck to turret { Min. inches	1 9/16	1⅞
Drive	4 stepped cone pulley . . . . . largest diam., inches	1½	
	Single pulley . . . . . diam., inches		2½
	Belt width . . . . . inches	1¼	1¼
Driving shaft speed . . . . . r.p.m.		120	240
Spindle Speed	Number of changes	8	
	Range . . . . . r.p.m.	120 to 2400	5000
Spring collet and feeding finger . . . . . size, inches		5/16	
Taper nose spring collet and feeding finger . . . . . size, inches			5/16
Scale on feed slide graduated to 1/32″ or Mm.			
Turret	Number of holes	6	6
	Diameter of holes . . . . . inches	⅝	⅝
	Center of holes to slide . . . . . inches	⅞	⅞
Production rate for one piece, per cycle of cams . seconds		1½ to 91	¾ to 45½
Countershaft	Pair tight and loose pulleys . . . . . diam., inches		8
	Two pairs tight and loose pulleys . . . . . diam., inches	8	
	Belt width . . . . . inches	3	3
	Speed . . . . . r.p.m.	141 and 380	535
Floor Space	Right angles to spindle . . . . . inches	22	27
	Parallel to spindle . . . . . inches	40	46½
Weights (Approx.)	Net { Machine . . . . . lbs.	725	775
	Net { Countershaft . . . . . lbs.	235	175
	Shipping { Machine . . . . . lbs.	950	1000
	Shipping { Countershaft (including wire stands) . . . . . lbs.	325	335
Equipment	Pump and piping, set of cam blanks, change gears, extra nut to take regular collet (High Speed Machine only), 2 wire stands, countershaft, and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	⅜	⅜
Spindle	For light work to . . . . . diam., inches (In place of regular spindle)	7/16	7/16

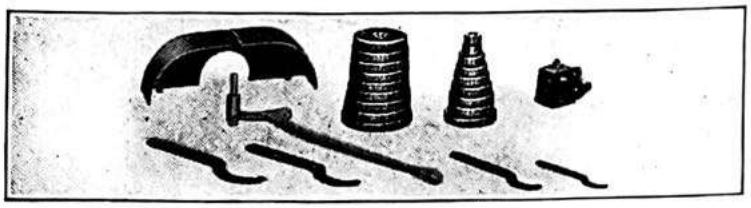
Turning capacity of 1¼″, with one movement of feeding mechanism feeding any length to 2″, at 120 r.p.m. driving shaft speed. (On High Speed Machine only.)

No. 0 Automatic Turret Forming Machine

No. 0 Automatic Turret Forming Machine

High Speed





No. 0 shown. No. 0 High Speed is similar in design to machine shown on page 170.

		No. 0	No. 0 (H.S.)
Capacity	Hole through largest regular feeding finger	½″	½″
	Turns any length to	2″	1¼″
	Feeds any length to	3″	2″
	Power required	2 H.P.	2 H.P.

No. 0 Automatic Turret Forming Machine
No. 0 Automatic Turret Forming Machine (High Speed)

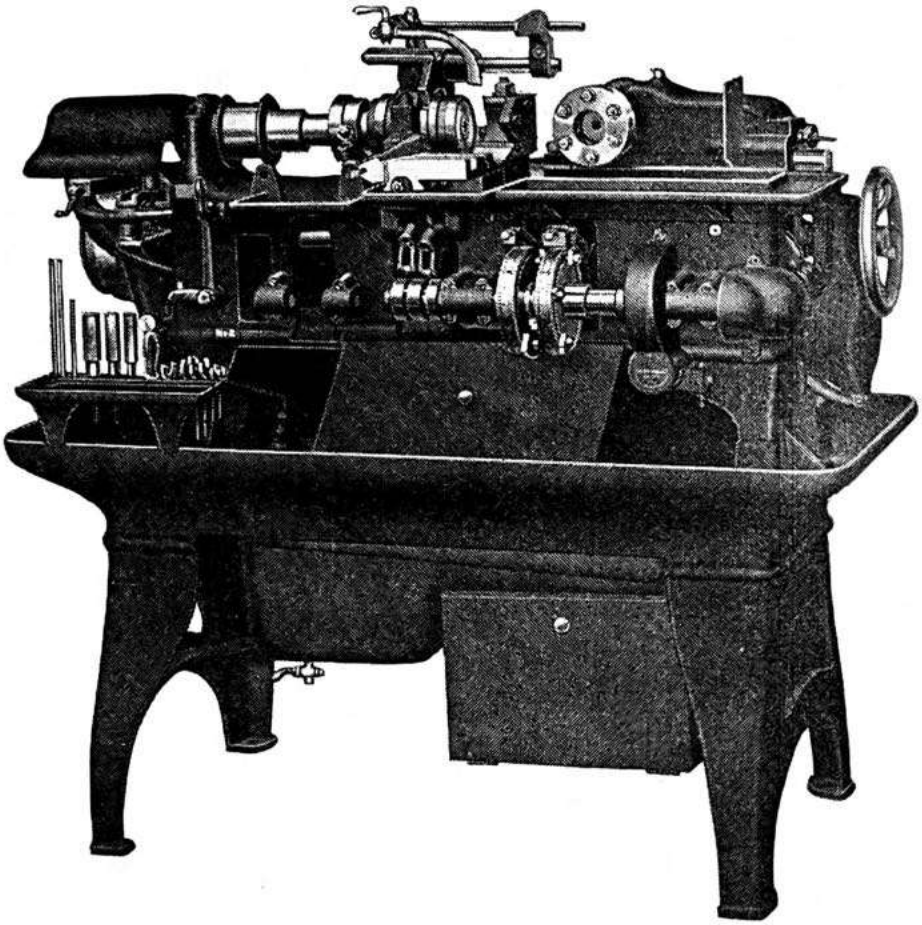
		No. 0	No. 0 (H.S.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	½	½
	Hole through feed tube . . diam., inches	17/32	17/32
	Hole through spindle . . . . diam., inches	⅞	⅞
	Turns any length to . . . . . inches	2	1¼
	One movement of feeding mechanism feeds any length to . . . . . inches	3	2
	Distance, chuck to turret { Max. inches	5⅛	5⅛
	Distance, chuck to turret { Min. inches	2⅛	2⅜
Drive	3 stepped cone pulley . . . . . largest diam., inches	6¼	
	Single pulley . . . . . diam., inches		3½
	Belt width . . . . . inches	2¼	2¼
Driving shaft speed . . . . . r.p.m.		180	180
Spindle Speed	Number of changes	6	
	Range . . . . . r.p.m.	300 to 1800	3600
Spring collet and feeding finger . . . . . size, inches		½	
Taper nose spring collet and feeding finger . . . . . size, inches			½
Scale on feed slide graduated to 1/32″ or Mm.			
Turret	Number of holes	6	6
	Diameter of holes . . . . . inches	¾	¾
	Center of holes to slide . . . . . inches	1⅜	1⅜
Production rate for one piece, per cycle of cams . . . . . seconds		3⅓ to 353	1⅔ to 176½
Countershaft	Pair tight and loose pulleys . . . . . diam., inches		8
	2 pairs of tight and loose pulleys . . . . . diam., inches	8	
	Belt width . . . . . inches	3	3
	Speed . . . . . r.p.m.	154 and 450	740
Floor Space	Right angles to spindle . . . . . inches	25	23
	Parallel to spindle . . . . . inches	51	50½
Weights (Approx.)	Net { Machine . . . . . lbs.	1200	1250
	Net { Countershaft . . . . . lbs.	235	160
	Shipping { Machine (including wire stands) . . . . . lbs.	1600	1650
	Shipping { Countershaft . . . . . lbs.	350	295
Equipment	Pump and piping, set of cam blanks, extra nut to take regular collet (High Speed Machine only), countershaft, change gears, 2 wire stands and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	⅝	⅝

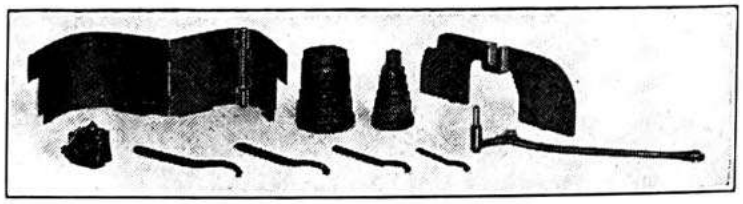
Turning capacity of 2″, with one movement of feeding mechanism feeding any length to 3″, at 120 r.p.m. driving shaft speed. (On High Speed Machine only.)

No. 2 Automatic Turret Forming Machine

No. 2 Automatic Turret Forming Machine

High Speed





No. 2 High Speed shown

		No. 2	No. 2 (H.S.)
Capacity	Hole through largest regular feeding finger	1″	1″
	Turns any length to	3″	2″
	Feeds any length to	4″	2½″
	Power required	3 H.P.	3 H.P.

No. 2 Automatic Turret Forming Machine
No. 2 Automatic Turret Forming Machine (High Speed)

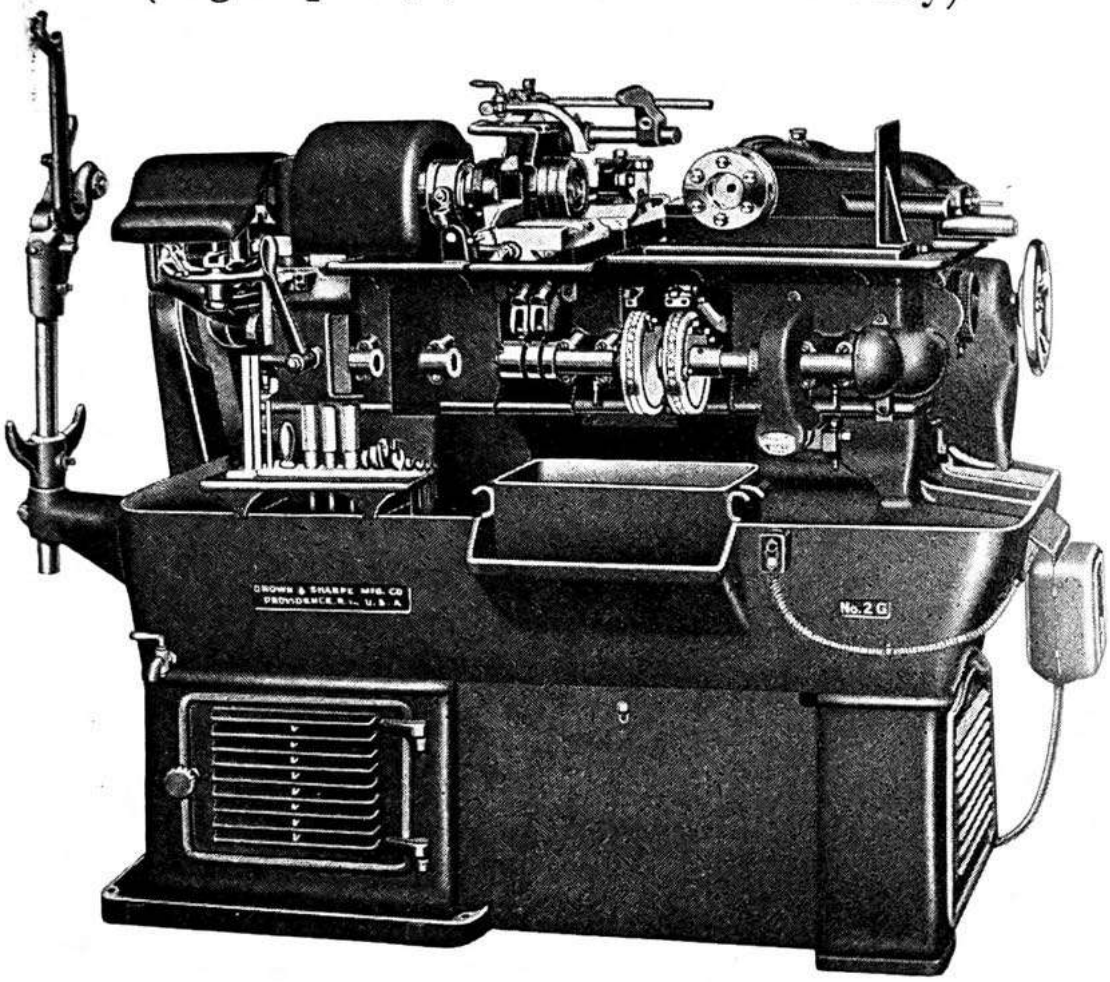
		No. 2	No. 2 (H.S.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	1	1
	Hole through feed tube . . . diam., inches	1 1/32	1 1/32
	Hole through spindle . . . . diam., inches	1 7/16	1 7/16
	Turns any length to . . . . . inches	3	2
	One movement of feeding mechanism feeds any length to . . . . . inches	4	2 1/2
	Distance, chuck to turret { Max. inches	6 3/4	6 3/4
	Distance, chuck to turret { Min. inches	2 1/2	2 1/2
Drive	3 stepped cone pulley . . . . . largest diam., inches	7 1/4	
	Single pulley . . . . . diam., inches		4
	Belt width . . . . . inches	2 3/4	2 1/2
Driving shaft speed . . . . . r.p.m.		120	240
Spindle Speed	Number of changes	6	
	Range . . . . . r.p.m.	180 to 1200	2400
Spring collet and feeding finger . . . . . size, inches		7/8	7/8
Scale on feed slide graduated to 1/32" or Mm.			
Turret	Number of holes	6	6
	Diameter of holes . . . . . inches	1	1
	Center of holes to slide . . . . . inches	1 1/2	1 1/2
Production rate for one piece, per cycle of cams . . . . . seconds		6 to 480	3 to 240
Countershaft	Pair tight and loose pulleys . . . . . diam., inches		12
	2 pairs tight and loose pulleys . . . . . diam., inches	12	
	Belt width . . . . . inches	3 1/2	3 1/2
	Speed . . . . . r.p.m.	128 and 400	500
Floor Space	Right angles to spindle . . . . . inches	26	26
	Parallel to spindle . . . . . inches	60	60
Weights (Approx.)	Net { Machine . . . . . lbs.	1650	1700
	Net { Countershaft . . . . . lbs.	325	235
	Shipping { Machine (including wire stands) . . . . . lbs.	2175	2200
	Shipping { Countershaft . . . . . lbs.	450	375
Equipment	Pump and piping, set of cam blanks, 2 wire stands, change gears, countershaft, and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	1 1/8	1 1/8

Turning capacity of 3", with one movement of feeding mechanism feeding any length to 4", at 120 r.p.m. driving shaft speed. (On High Speed Machine only.)

Nos. 00G, 0G and 2G

Automatic Turret Forming Machines

(High Speed) (For Motor Drive Only)



No. 2G shown

		No. 00G	No. 0G	No. 2G
Capacity	Hole through largest regular feeding finger	5/16″	1/2″	1″
	Turns any length to	3/4″	1 1/4″	2″
	Feeds any length to	1″	2″	2 1/2″
	Power required	2 H.P.	3 H.P.	5 H.P.

Nos. 00G, 0G and 2G Automatic Turret Forming Machines
(High Speed) (For Motor Drive Only)

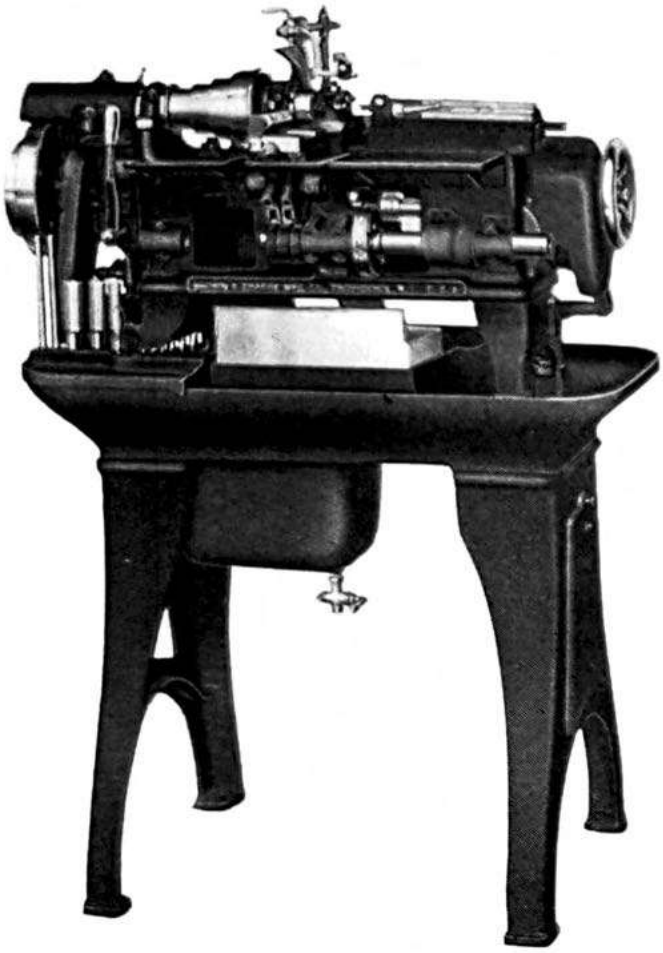
		No. 00G	No. 0G	No. 2G
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	5/16	1/2	1
	Hole through feed tube diam., inches	21/64	17/32	1 1/32
	Hole through spindle diam., inches	9/16	7/8	1 7/16
	Turns any length to . . . . . inches	3/4	1 1/4	2
	One movement of feeding mechanism feeds any length to. . . . inches	1	2	2 1/2
	Distance. chuck to turret . . . . . Max. inches	2 15/16	5 1/8	6 3/4
	Distance. chuck to turret . . . . . Min. inches	1 7/8	2 3/8	2 1/2
Drive	Motor connected direct to main driving shaft			
	Motor speed . . . . . r.p.m.	1800	1800	1800
Driving shaft speed . . . . . r.p.m.		240	180	240
Spindle Speed	Number of changes	10	10	10
	Range . . . . . r p.m.	1212 to 5000	872 to 3600	585 to 2400
Spring collet and feeding finger. . . . . size, inches		5/16	1/2	7/8
Scale on feed slide graduated to 1/32" or Mm.				
Turret	Number of holes	6	6	6
	Diameter of holes . . . . . inches	5/8	3/4	1
	Center of holes to slide . . . . . inches	7/8	1 3/8	1 1/2
Production rate for one piece, per cycle of cams . . . . . seconds		3/4 to 45 1/2	1 2/3 to 176 1/2	3 to 240
Floor Space	Right angles to spindle . . . . . inches	29 1/2	29	31
	Parallel to spindle . . . . . inches	46	59	61
Weights (Approx.)	Net — For motor . . . . . lbs.	1450	1925	2500
	Net — With motor . . . . . lbs.	1550	2025	2600
	Shipping — For motor . . . . . lbs.	1850	2475	3000
	Shipping — With motor . . . . . lbs.	1950	2575	3125
Equipment	Pump and piping, set of cam blanks, extra nut to take regular collet (on Nos. 00G and 0G), spindle driving belt, 2 wire stands, change gears and grease gun for lubricating bearings.			
Furnished as Extra—				
Feed Tube	For light work to. . . . . diam., inches	3/8	5/8	1 1/8
Spindle	For light work to. . . . . diam., inches (In place of regular spindle)	7/16		

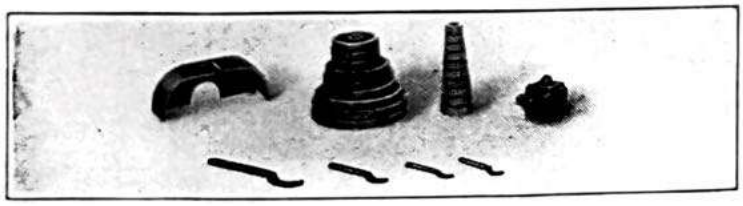
Turning capacity of 1 1/4" on No. 00G, 2" on No. 0G, 3" on No. 2G, with one movement of feeding mechanism feeding any length to 2" on No. 00G, 3" on No. 0G, 4" on No. 2G, at 120 r.p.m. driving shaft speed.

No. 00 Automatic Cutting-Off Machine

No. 00 Automatic Cutting-Off Machine

High Speed





No. 00 shown. No. 00 High Speed is similar in design to machine shown on page 168.

		No. 00	No. 00 (H.S).
Capacity	Hole through largest regular feeding finger	5/16″	5/16″
	Greatest length fed by one movement of feeding mechanism (Greater lengths can be fed by successive movements)	2″	1″
	Power required	1½ H.P.	1½ H.P.

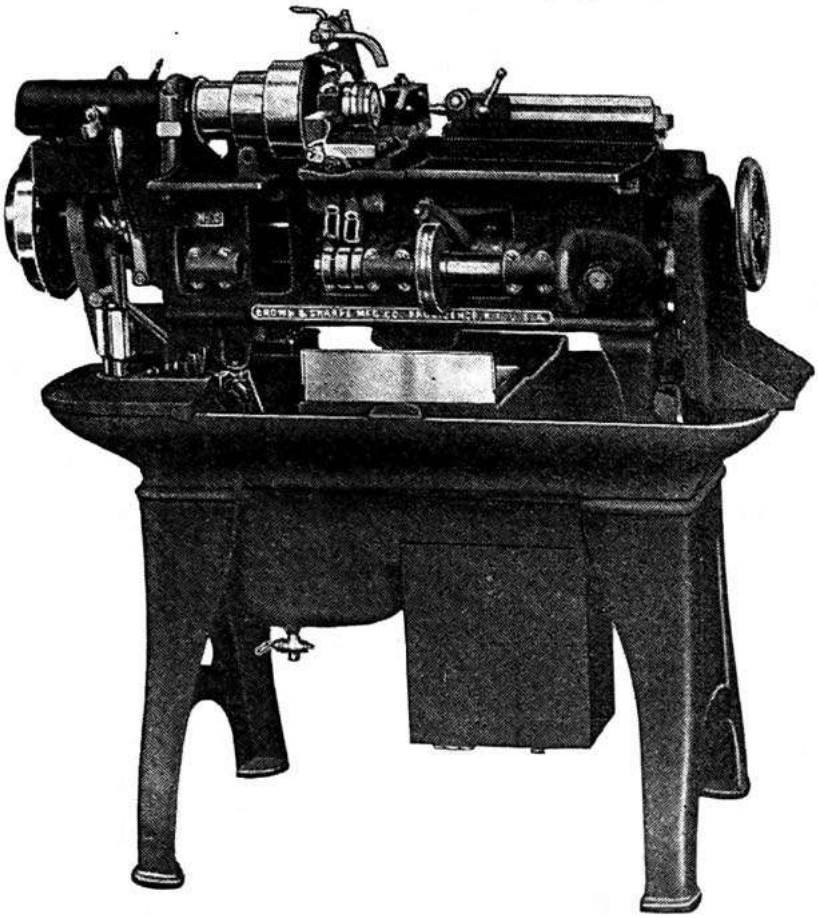
No. 00 Automatic Cutting-Off Machine
No. 00 Automatic Cutting-Off Machine (High Speed)

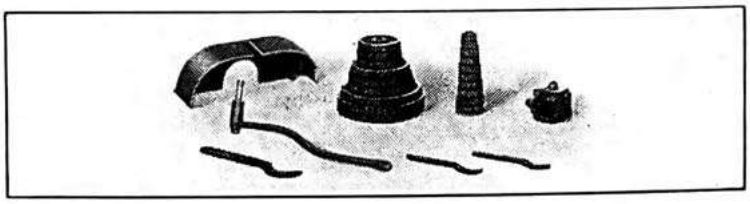
		No. 00	No. 00 (H.S.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	5/16	5/16
	Hole through feed tube diam., inches	21/64	21/64
	Hole through spindle . . . . diam., inches	7/16	7/16
	One movement of feeding mechanism feeds any length to . . . . . inches	2	1
	Distance, tool holder to face of chuck . . . . . Max. inches	10	10
	Distance, tool holder to face of chuck . . . . . Min. inches	1 3/4	1 3/4
Drive	4 stepped cone pulley . . . . . largest diam., inches	4 1/2	
	Single pulley . . . . . diam., inches		2 1/2
	Belt width . . . . . inches	1 1/4	1 1/4
Driving shaft speed . . . . . r.p.m.		120	240
Spindle Speed	Number of changes	8	
	Range . . . . . r.p.m.	120 to 2400	5000
Spring collet and feeding finger . . . . . size, inches		5/16	
Taper nose spring collet and feeding finger . . . . . size, inches			5/16
Scale on feed slide graduated to 1/32" or Mm.			
Tool Slide	Tool holder takes single tool.		
	Has hole . . . . . diam., inches	5/8	5/8
	Has movement of . . . . . inches	1 1/4	1 1/4
Production rate for one piece, per cycle of cams . seconds		3 to 91	3/4 to 45 1/2
Countershaft	Pair tight and loose pulleys . . . . . diam., inches		8
	Two pairs of tight and loose pulleys . . . . . diam., inches	8	
	Belt width . . . . . inches	3	3
	Speed . . . . . r.p.m.	141 and 380	535
Floor Space	Right angles to spindle . . . . . inches	22	27
	Parallel to spindle . . . . . inches	40	40 1/2
Weights (Approx.)	Net — Machine . . . . . lbs.	675	750
	Net — Countershaft . . . . . lbs.	235	175
	Shipping — Machine . . . . . lbs.	925	975
	Shipping — Countershaft (including wire stands) . . . . . lbs.	325	335
Equipment	Pump and piping, set of cam blanks, change gears, countershaft, extra nut to take regular collet (High Speed Machine only), 2 wire stands and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	3/8	3/8
Spindle	For light work to . . . . . diam., inches (In place of regular spindle)	7/16	7/16
One movement of feeding mechanism to feed any length to 2", at 120 r.p.m. driving shaft speed. (On High Speed Machine only.)			

No. 0 Automatic Cutting-Off Machine

No. 0 Automatic Cutting-Off Machine

High Speed





No. 0 shown. No. 0 High Speed is similar in design to machine shown on page 170.

		No. 0	No. 0 (H.S.)
Capacity	Hole through largest regular feeding finger	½″	½″
	Greatest length fed by one movement of feeding mechanism (Greater lengths can be fed by successive movements)	3″	2″
	Power required	2 H.P.	2 H.P.

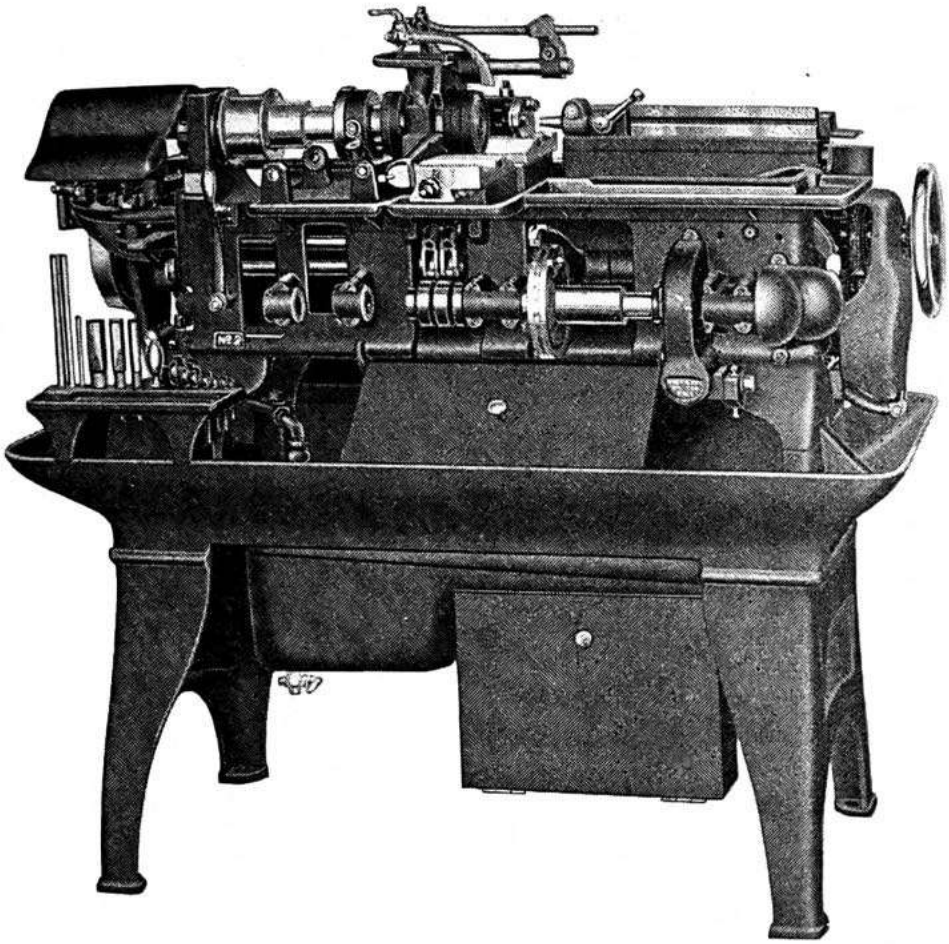
No. 0 Automatic Cutting-Off Machine
No. 0 Automatic Cutting-Off Machine (High Speed)

		No. 0	No. 0 (H.S.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	½	½
	Hole through feed tube . . diam., inches	17/32	17/32
	Hole through spindle . . . . diam., inches	⅞	⅞
	One movement of feeding mechanism feeds any length to . . . . . inches	3	2
	Distance, tool slide to face of chuck . . . . . Max. inches	12	12
	Distance, tool slide to face of chuck . . . . . Min. inches	2	2
Drive	3 stepped cone pulley . . . . . largest diam., inches	6¼	
	Single pulley . . . . . diam., inches		3½
	Belt width . . . . . inches	2¼	2¼
Driving shaft speed . . . . . r.p.m.		180	180
Spindle Speed	Number of changes	6	
	Range . . . . . r.p.m.	300 to 1800	3600
Spring collet and feeding finger . . . . . size, inches		½	
Taper nose spring collet and feeding finger . . . . . size, inches			½
Scale on feed slide graduated to 1/32″ or Mm.			
Tool Slide	Tool holder takes single tool.		
	Has hole . . . . . diam., inches	¾	¾
	Has movement of . . . . . inches	2	2
Production rate for one piece, per cycle of cams . . seconds		3⅓ to 353	1⅔ to 176½
Countershaft	Pair of tight and loose pulleys . . . . . diam., inches		8
	2 pairs tight and loose pulleys . . . . . diam., inches	8	
	Belt width . . . . . inches	3	3
	Speed . . . . . r.p.m.	154 and 450	740
Floor Space	Right angles to spindle . . . . . inches	25	23
	Parallel to spindle . . . . . inches	51	50½
Weights (Approx.)	Net — Machine . . . . . lbs.	1175	1230
	Net — Countershaft . . . . . lbs.	235	160
	Shipping — Machine (including wire stands) . . . . . lbs.	1575	1630
	Shipping — Countershaft . . . . . lbs.	350	295
Equipment	Pump and piping, set of cam blanks, change gears, countershaft, extra nut to take regular collet (High Speed Machine only), 2 wire stands and everything else shown in cuts.		
Furnished as Extra—			
Feed Tube	For light work to . . . . . diam., inches	⅝	⅝
One movement of feeding mechanism to feed any length to 3″, at 120 r.p.m. driving shaft speed. (On High Speed Machine only.)			

No. 2 Automatic Cutting-Off Machine

No. 2 Automatic Cutting-Off Machine

High Speed



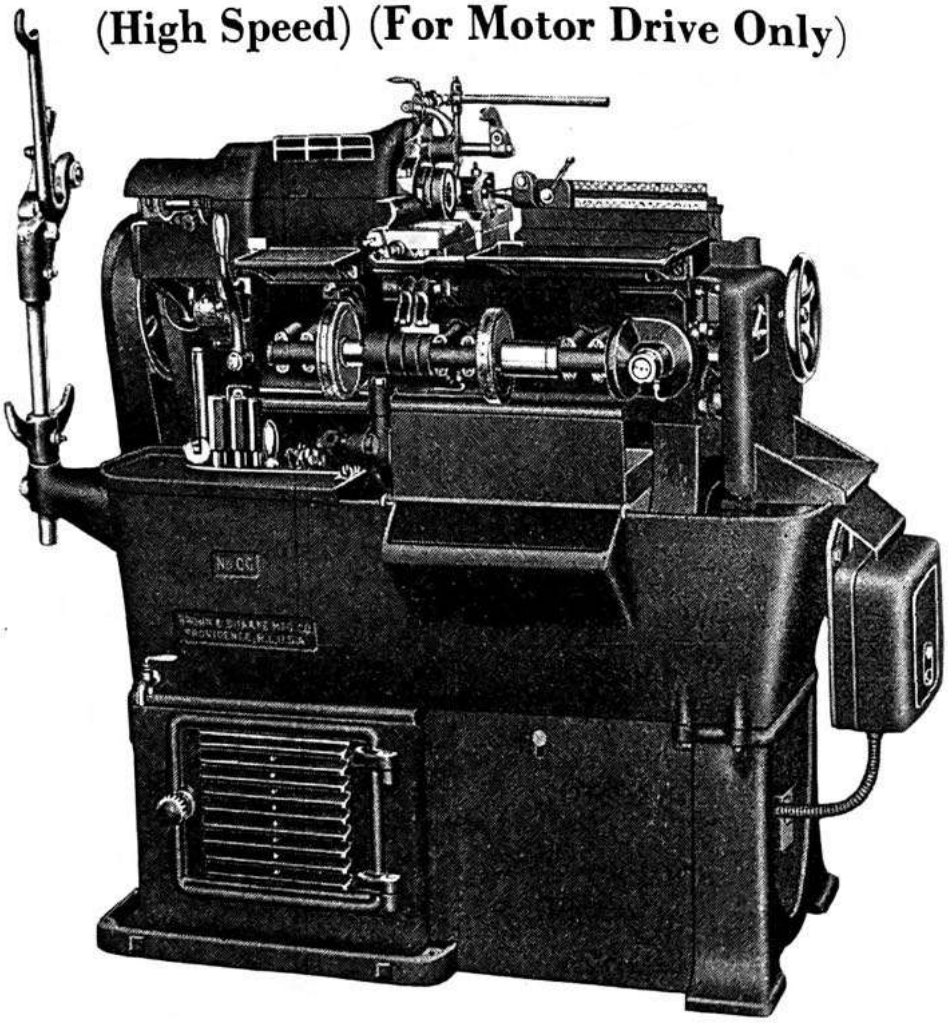
No. 2 High Speed shown

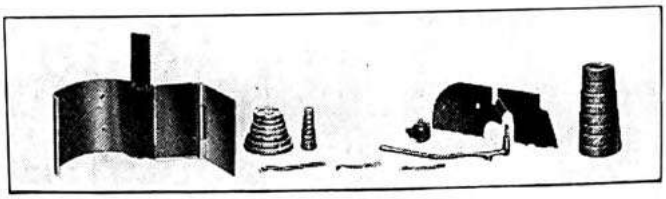
		No. 2	No. 2 (H.S.)
Capacity	Hole through largest regular feeding finger	1″	1″
	Greatest length fed by one movement of feeding mechanism (Greater lengths can be fed by successive movements)	4″	2½″
	Power required	3 H.P.	3 H.P.

No. 2 Automatic Cutting-Off Machine
No. 2 Automatic Cutting-Off Machine (High Speed)

		No. 2	No. 2 (H.S.)
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	1	1
	Hole through feed tube . . diam., inches	1 1/32	1 1/32
	Hole through spindle . . . . diam., inches	1 7/16	1 7/16
	One movement of feeding mechanism feeds any length to . . . . . inches	4	2 1/2
	Distance, tool holder to face of chuck . . . . . Max. inches	16	16
	Distance, tool holder to face of chuck . . . . . Min. inches	2 1/2	2 1/2
Drive	3 stepped cone pulley . . . . . largest diam., inches	7 1/4	
	Single pulley . . . . . diam., inches		4
	Belt width . . . . . inches	2 3/4	2 1/2
Driving shaft speed . . . . . r.p.m.		120	240
Spindle Speed	Number of changes	6	
	Range . . . . . r.p.m.	180 to 1200	2400
Spring collet and feeding finger . . . . . size, inches		7/8	7/8
Scale on feed slide graduated to 1/32" or Mm.			
Tool Slide	Tool holder takes single tool.		
	Has hole . . . . . diam., inches	1	1
	Has movement of . . . . . inches	3	3
Production rate for one piece, per cycle of cams . seconds		6 to 480	3 to 240
Countershaft	2 pairs of tight and loose pulleys . . . . . diam., inches	12	
	Pair tight and loose pulleys . . . . . diam., inches		12
	Belt width . . . . . inches	3 1/2	3 1/2
	Speed . . . . . r.p.m.	128 and 400	416
Floor Space	Right angles to spindle . . . . . inches	26	28
	Parallel to spindle . . . . . inches	60	61
Weights (Approx.)	Net — Machine . . . . . lbs.	1625	1675
	Net — Countershaft . . . . . lbs.	325	235
	Shipping — Machine (including wire stands) . . . . . lbs.	2150	2175
	Shipping — Countershaft . . . . . lbs.	400	375
Equipment	Pump and piping, set of cam blanks, change gears, countershaft, 2 wire stands and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	1 1/8	1 1/8
One movement of feeding mechanism to feed any length to 4", at 120 r.p.m. driving shaft speed. (On High Speed Machine only.)			

Nos. 00G, 0G and 2G
Automatic Cutting-Off Machines
(High Speed) (For Motor Drive Only)





No. 0G shown		No. 00G	No. 0G	No. 2G
Capacity	Hole through largest regular feeding finger	5/16″	1/2″	1″
	Greatest length fed by one movement of feeding mechanism (Greater lengths can be fed by successive movements)	1″	2″	2 1/2″
	Power required	2 H.P.	3 H.P.	5 H.P.

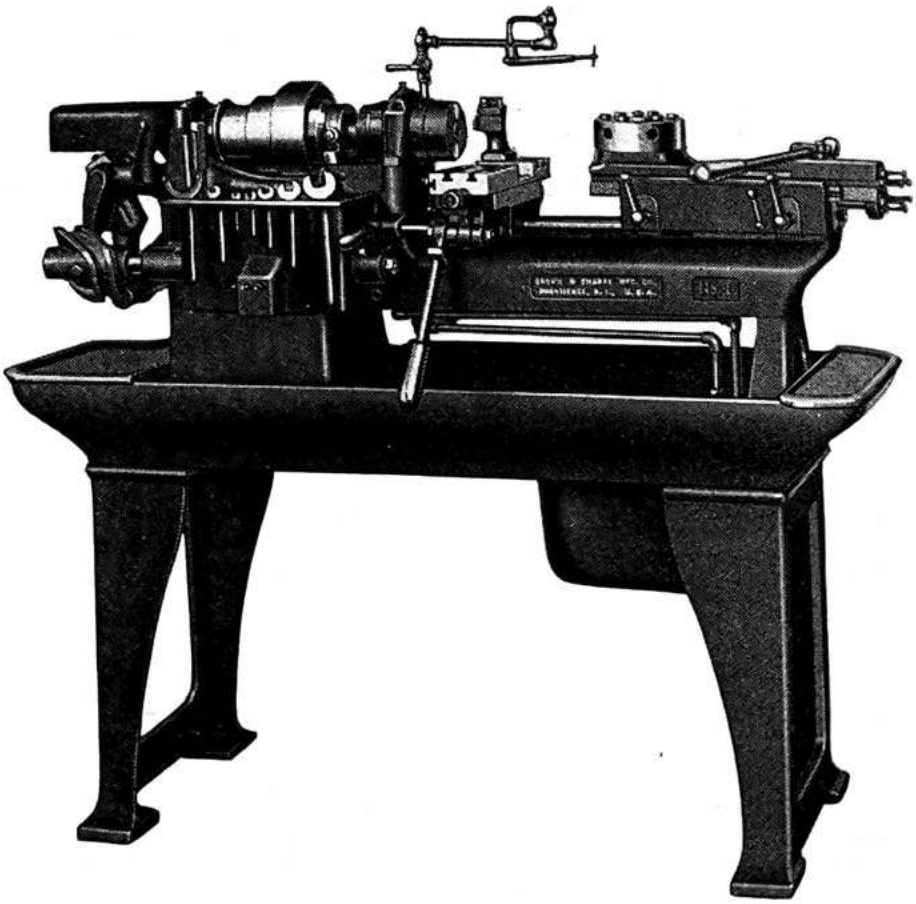
Nos. 00G, 0G and 2G Automatic Cutting-Off Machines

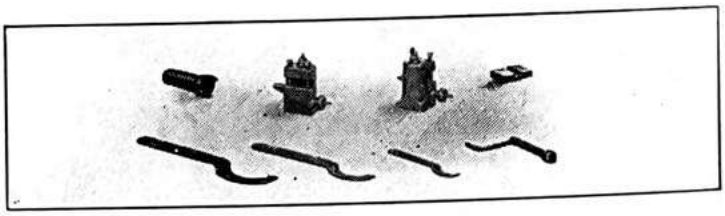
(High Speed) (For Motor Drive Only)

		No. 00G	No. 0G	No. 2G
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	5/16	1/2	1
	Hole through feed tube, diam., inches	21/64	17/32	1 1/32
	Hole through spindle, diam., inches	9/16	7/8	1 7/16
	One movement of feeding mechanism feeds any length to. . . . inches	1	2	2 1/2
	Distance, tool holder to face to chuck . . . . . Max. inches	10	12	16
	Distance, tool holder to face to chuck . . . . . Min. inches	1 3/4	2	2 1/2
Drive	Motor connected direct to main driving shaft.			
	Motor speed . . . . . r.p.m.	1800	1800	1800
Driving shaft speed . . . . . r.p.m.		240	180	240
Spindle Speed	Number of changes	10	10	10
	Range . . . . . r.p.m.	1212 to 5000	872 to 3600	585 to 2400
Spring collet and feeding finger. . . . . size, inches		5/16	1/2	7/8
Scale on feed slide graduated to 1/32″ or Mm.				
Tool Slide	Tool holder takes single tool.			
	Has hole . . . . . diam., inches	5/8	3/4	1
	Has movement of . . . . . inches	1 1/4	2	3
Production rate for one piece, per cycle of cams . . . . . seconds		3/4 to 45 1/2	1 2/3 to 176 1/2	3 to 240
Floor Space	Right angles to spindle . . . . . inches	29 1/2	29	31
	Parallel to spindle . . . . . inches	46	59	61
Weights (Approx.)	Net — For motor . . . . . lbs.	1450	1925	2500
	Net — With motor . . . . . lbs.	1550	2025	2600
	Shipping — For motor . . . . . lbs.	1850	2475	3000
	Shipping — With motor . . . . . lbs.	1950	2575	3125
Equipment	Pump and piping, set of cam blanks, extra nut to take regular collet (on Nos. 00G and 0G), spindle driving belt, 2 wire stands, change gears and grease gun for lubricating bearings.			
Furnished as Extra—				
Feed Tube	For light work to. . . . diam., inches	3/8	5/8	1 1/8
Spindle	For light work to . . . . diam., inches (In place of regular spindle)	7/16		

One movement of feeding mechanism to feed any length to 2″ on No. 00G, 3″ on No. 0G, 4″ on No. 2G, at 120 r.p.m. driving shaft speed.

Nos. 0 and 1
Wire Feed Screw Machines





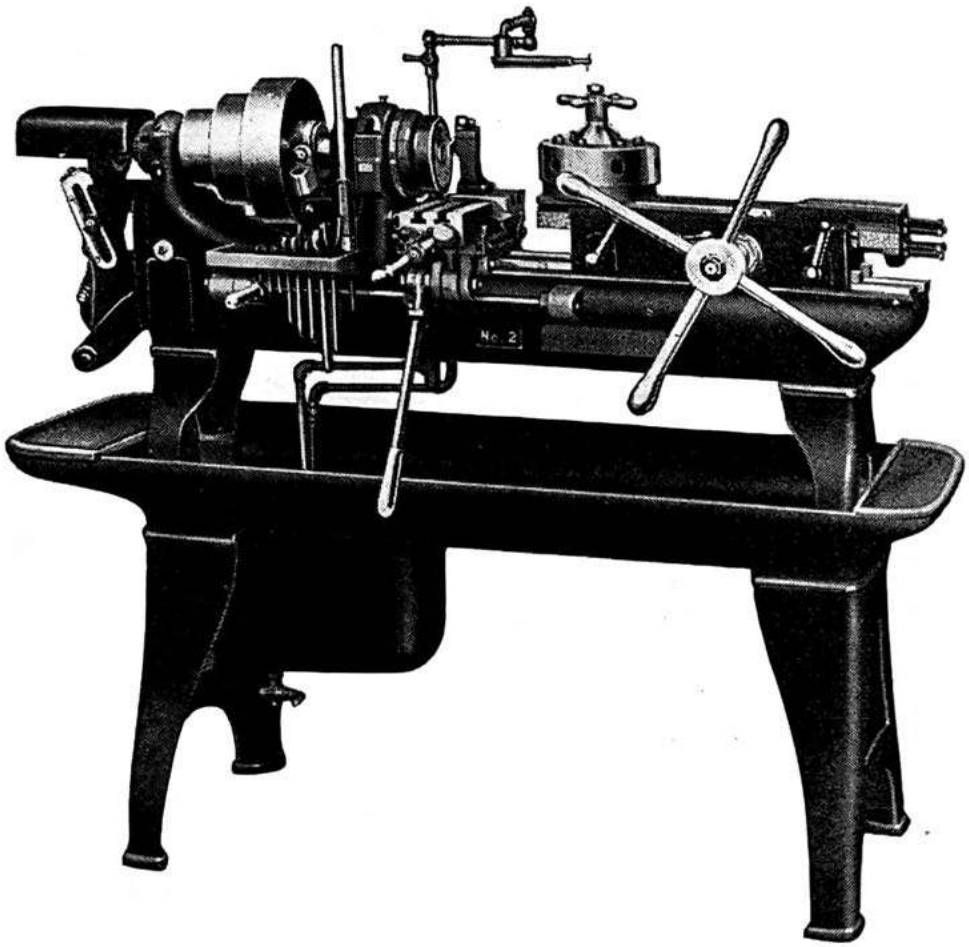
No. 1 shown

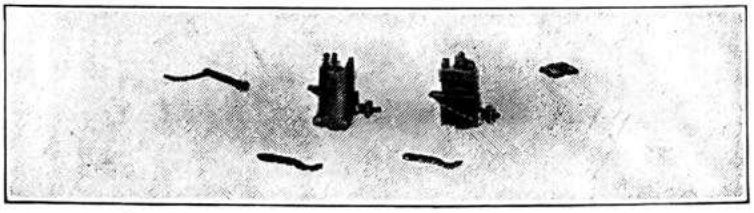
		No. 0	No. 1
Capacity	Hole through largest regular feeding finger	3/8″	5/8″
	Turns any length to	2¼″	4″
	Greatest distance, turret to front of chuck	7″	12½″
	Power required	2 H.P.	3 H.P.

Nos. 0 and 1 Wire Feed Screw Machines

		No. 0	No. 1
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	3/8	5/8
	Hole through feed tube . . diam., inches	13/32	21/32
	Hole through spindle . . . . diam., inches	7/8	1 1/4
	Turns any length to . . . . . inches	2 1/4	4
	One movement of feed lever feeds any length to . . . . . inches	3	4
	Stock can be fed through turret to . . . . . diam., inches	3/8	5/8
	Greatest distance, turret to front of chuck . . . . . inches	7	12 1/2
	Swing over bed . . . . . inches	9 1/4	11 1/4
	Swing over cross slide . . . . . inches	3 1/8	4 1/8
Spindle	Diameter . . . . . inches	2	2 3/4
	Threaded . . . . . Ntl. Std., R.H.	12	8
	Spring collet and feeding finger . . . . . size, inches	3/8	5/8
Drive	3 stepped cone pulley . largest diam., in.	5 13/64	7
	Belt width . . . . . inches	1 1/4	1 3/4
Spindle Speed	Number of changes . . . . . Forward	6	6
	Number of changes . . . . . Backward	3	3
	Range Forward . . . . . r.p.m.	220 to 1455	170 to 1150
	Range Backward . . . . . r.p.m.	2125 to 4500	1625 to 3600
Scales on feed lever and turret slide graduated to 1/32" or Mm.			
Turret	Number of holes	6	6
	Diameter of holes . . . . . inches	5/8	3/4
	Center of holes to top of slide . . . . inches	1 3/8	1 13/16
Countershaft	Two friction pulleys . . . . . diam., inches	8	10
	Width of belts . . . . . inches	2 1/2	3
	One friction pulley . . . . . diam., inches	12	12
	Width of belt . . . . . inches	3 1/2	3 1/2
	Speeds Forward . . . . . r.p.m.	75 and 234	75 and 234
	Speeds Backward . . . . . r.p.m.	730	730
Floor Space	Right angles to spindle . . . . . inches	28 1/4	31
	Parallel to spindle . . . . . inches	58 3/4	67 3/4
Weights (Approx.)	Net Machine . . . . . lbs.	485	750
	Net Countershaft . . . . . lbs.	275	275
	Shipping Including countershaft . . . . . lbs.	1030	1320
Equipment	Pump and piping, overhead works, 2 wire stands and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	5/8	7/8

No. 2
Wire Feed Screw Machine





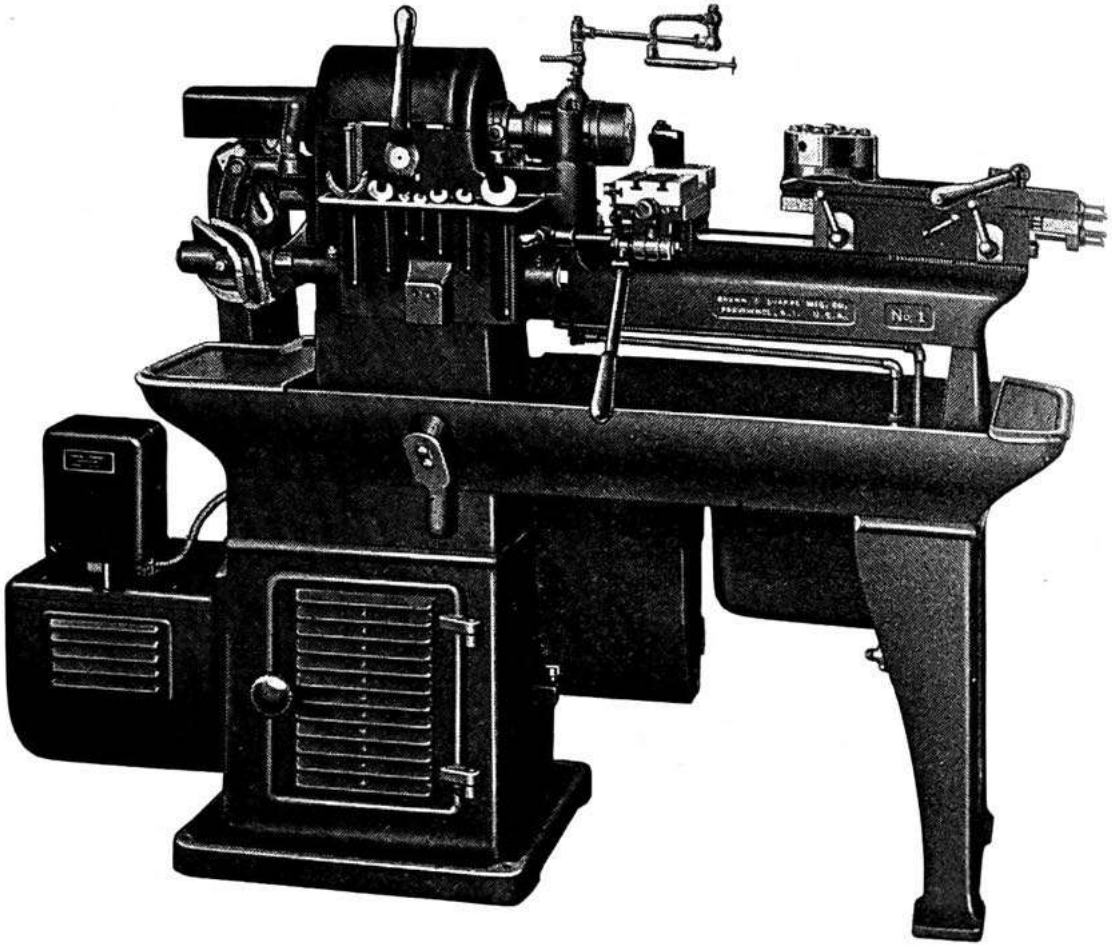
Capacity	Hole through largest regular feeding finger . . .	1″
	Turns any length to	5″
	Greatest distance, turret to front of chuck . . .	15½″
	Power required	3 H.P.

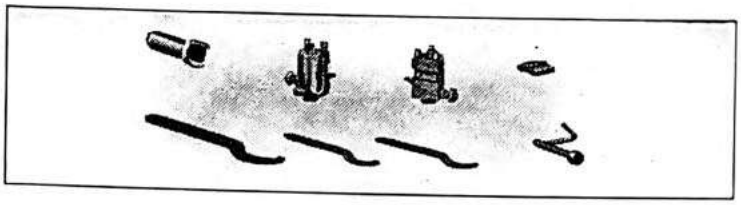
No. 2 Wire Feed Screw Machine

Capacity	Hole through largest regular feeding finger . . . . diam., inches	1
	Hole through feed tube . . . . diam., inches	1 1/32
	Hole through spindle . . . . diam., inches	1 7/16
	Turns any length to . . . . inches	5
	One movement of feed lever feeds any length to . . inches	5
	Greatest distance, turret to front of chuck . . . . inches	15 1/2
	Swing over bed . . . . inches	12 1/2
	Swing over cross slide . . . . inches	5
Spindle	Diameter . . . . inches	3 1/2
	Threaded . . . . Ntl. Std., R.H.	8
	Spring collet and feeding finger . . . . size, inches	7/8
Drive	3 stepped cone pulley . . . . largest diam., inches	9 1/2
	Belt width . . . . inches	2 1/2
Spindle Speed	Number of changes . . . . Forward	6
	Number of changes . . . . Backward	3
	Range Forward . . . . r.p.m.	100 to 1000
	Range Backward . . . . r.p.m.	398 to 1000
Scale on feed lever graduated to 1/8″ or Mm.		
Scale on turret slide graduated to 1/32″ or Mm.		
Turret	Number of holes	6
	Diameter of holes . . . . inches	1
	Center of holes to top of slide . . . . inches	2 1/8
Countershaft	Two friction pulleys . . . . diam., inches	12
	Width of belts . . . . inches	3 1/2
	One friction pulley . . . . diam., inches	14
	Width of belt . . . . inches	4
	Speeds Forward . . . . r.p.m.	100 and 398
	Speeds Backward . . . . r.p.m.	398
Floor Space	Right angles to spindle . . . . inches	33
	Parallel to spindle . . . . inches	68
Weights (Approx.)	Net Machine . . . . lbs.	1150
	Net Countershaft . . . . lbs.	375
	Shipping Including countershaft . . . . lbs.	1965
Equipment	Pump and piping, overhead works, 2 wire stands and everything else shown in cuts.	
	Furnished as Extra—	
Feed Tube	For light work to . . . . diam., inches	1 1/8

Automatic Feed for Turret Slide. Driven from machine spindle. Feeds obtained through gear cones with sliding key. Changes made without stopping machine.
Range of feeds: .003, .005, .008, .012 and .020 inches per revolution of spindle.

Nos. 0 and 1
Wire Feed Screw Machines
For Motor Drive Only





No. 1 shown

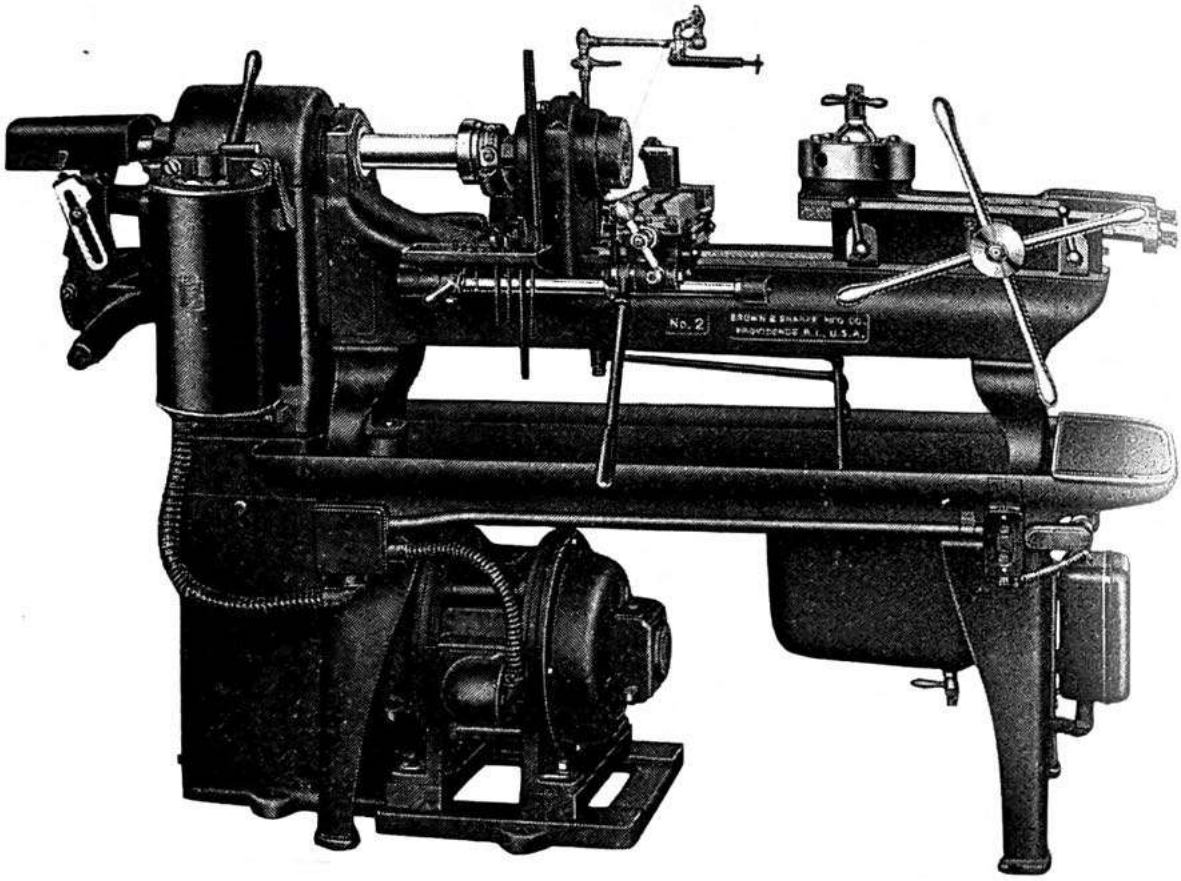
		No. 0	No. 1
Capacity	Hole through largest regular feeding finger	3/8″	5/8″
	Turns any length to	2¼″	4″
	Greatest distance, turret to front of chuck	7″	12½″
	Power required	2 H.P.	3 H.P.

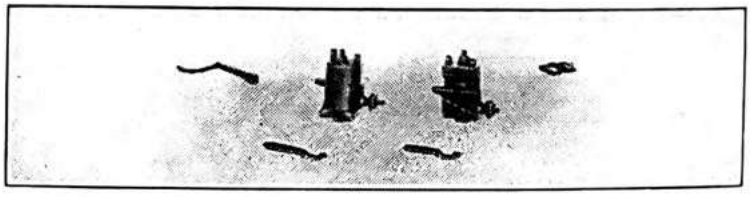
Nos. 0 and 1 Wire Feed Screw Machines

For Motor Drive Only

		No. 0	No. 1
Capacity	Hole through largest regular feeding finger . . . . . diam., inches	3/8	5/8
	Hole through feed tube . . diam., inches	13/32	21/32
	Hole through spindle . . . . diam., inches	7/8	1 1/4
	Stock can be fed through turret to . . . . . diam., inches	3/8	5/8
	One movement of feed lever feeds any length to . . . . . inches	3	4
	Turns any length to . . . . . inches	2 1/4	4
	Distance, front of chuck to turret inches	7	12 1/2
	Swing over bed . . . . . inches	9 1/4	11 1/4
	Swing over cross slide . . . . . inches	3 1/8	4 1/8
Spindle	Diameter . . . . . inches	2	2 3/4
	Threaded . . . . . Ntl. Std., R.H.	12	8
	Spring collet and feeding finger . . . . . size. inches	3/8	5/8
Drive	By constant speed motor. Motor Speed . . . . . r.p.m.	1800	1800
Spindle Speed	Forward (By chain and sprockets) — Number of changes . . .	10	10
	Forward (By chain and sprockets) — Range . . . . . r.p.m.	220 to 915	175 to 730
	Backward (By belt) — Number of changes	10	10
	Backward (By belt) — Range . . . . . r.p.m.	1100 to 4500	880 to 3520
Feeding Mechanism	Independent of spindle speed.		
Scales on feed lever and turret slide graduated to 1/32" or Mm.			
Turret	Number of holes	6	6
	Diameter of holes . . . . . inches	5/8	3/4
	Center of holes to top of slide . . . . inches	1 3/8	1 13/16
Floor Space	At right angles to spindle . . . . . inches	43 1/4	43 1/4
	Parallel to spindle . . . . . inches	61	77
Weights (Approx.)	Net — Fitted for motor . . . . . lbs.	1030	1300
	Net — Fitted with motor . . . . . lbs.	1300	1620
	Shipping — Fitted for motor . . . . . lbs.	1430	1770
	Shipping — Fitted with motor . . . . . lbs.	1735	2020
Equipment	Pump and piping, 2 wire stands and everything else shown in cuts.		
	Furnished as Extra—		
Feed Tube	For light work to . . . . . diam., inches	5/8	7/8

No. 2
Wire Feed Screw Machine
For Motor Drive Only





Capacity	Hole through largest regular feeding finger . .	1″
	Turns any length to	5″
	Greatest distance, turret to front of chuck . . .	15½″
	Power required	5¼ H.P.

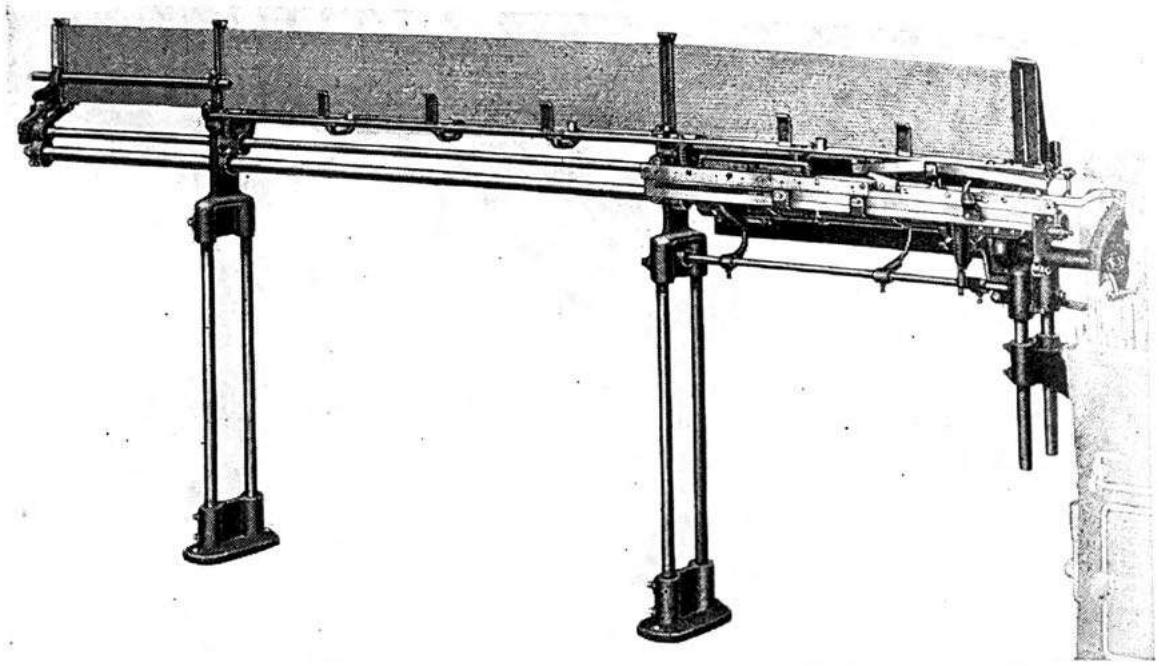
No. 2 Wire Feed Screw Machine (For Motor Drive Only)

Capacity		Hole through largest regular feeding finger . . . . diam., inches	1
		Hole through feed tube . . . . diam., inches	1 1/32
		Hole through spindle . . . . diam., inches	1 7/16
		One movement of feed lever feeds any length to . . inches	5
		Turns any length to . . . . inches	5
		Distance, front of chuck to turret . . . . max., inches	15 1/2
		Swing over bed . . . . inches	12 1/2
		Swing over cross slide . . . . inches	5
Spindle		Diameter . . . . inches	3 1/2
		Threaded . . . . Ntl. Std., R.H.	8
		Spring collet and feeding finger . . . . size, inches	7/8
Drive		2 friction clutch pulleys . . . . diam., inches	7
		Belt width . . . . inches	2 1/2
	Alternating Current	By adjustable speed motor. Speeds . . . . r.p.m.	600, 900 1200 and 1800
	Direct Current	By variable speed motor. Speeds . . . . r.p.m.	650 to 1950
Spindle Speed	Alternating Current	Number of changes	8
		Range (either direction) Right-hand pulley . . . . r.p.m.	401, 602, 803 and 1205
		Range (either direction) Left-hand pulley . . . . r.p.m.	100, 150, 200 and 300
	Direct Current	Range (either direction) Right-hand pulley . . . . r.p.m.	135 to 1300
		Range (either direction) Left-hand pulley . . . . r.p.m.	108 to 325
Feeding Mechanism		Independent of spindle speeds. Operated by 1/4 H.P. Motor . . . . r.p.m.	1725
Scale on feed lever graduated to 1/8" or Mm.			
Scale on turret slide graduated to 1/32" or Mm.			
Turret		Number of holes	6
		Diameter of holes . . . . inches	1
		Center of holes to top of slide . . . . inches	2 1/8
Floor Space		At right angles to spindle . . . . inches	33
		Parallel to spindle . . . . inches	84
Weights (Approx.)		Net: Fitted for motor . . . . lbs.	1450
		Net: Fitted with motor . . . . lbs.	1875
		Shipping: Fitted for motor . . . . lbs.	1975
		Shipping: Fitted with motor . . . . lbs.	2550
Equipment		Pump and piping, 2 wire stands and everything else shown in cuts.	
		Furnished as Extra—	
Feed Tube		For light work to . . . . diam., inches	1 1/8

Automatic Feed for Turret Slide. Driven from machine spindle. Feeds obtained through gear cones with sliding key. Changes made without stopping machine.
Range of feeds: .003, .005, .008, .012 and .020 inches per revolution of spindle.

Automatic Rod Magazines

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes. Also Nos. 00 and 00G Automatic Screw Threading Machines (High Speed)



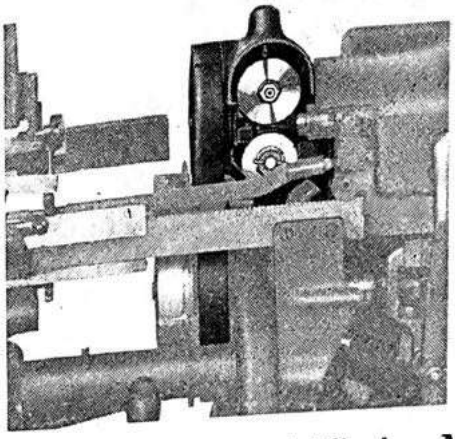
The Automatic Rod Magazine is simple in construction and operation. It consists of an arrangement for keeping the machine in continuous operation without the necessity of inserting each bar by hand. The stock is fed by the magazine through the feeding finger and chuck to the required position. The operation of the Rod Magazine is timed in correct relation to the automatic functioning of the machine.

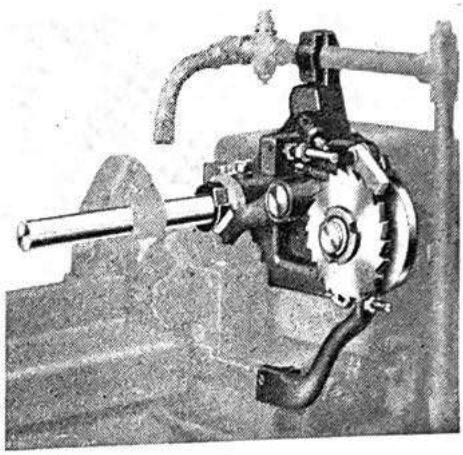
Machine where used	Diameter of Work, Inches				Length of Bar, Ft.	Depth of Magazine,* In.	Floor Space†			Weight, Lbs.	
	Maximum		Minimum				Width, In.	Ht., In.	Lgth.,‡ Ft.	Net	Shipping
	Rd.	Hex.	Rd.	Hex.							
00, 00G	3/8	5/16	3/32	3/32	10	10	11½	56½	14	490	700
0, 0G	5/8	1/2	3/16	3/16	10	10	11½	57	15¼	600	830
2	1⅛	1	1/4	1/4	10	9	17	54½	16¼	725	975
2G	Complete information furnished upon request.										

*Single Row of Rods. †Approximately same as stock stands generally used.
‡Including machine, less starting equipment.

Roller Feed and Timing Mechanisms

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these Sizes





The Roller Feed and Timing Mechanism is used in conjunction with the Automatic Rod Magazine. It is designed primarily for use on jobs where the part is unusually long or of such length to necessitate more than one movement of the machine's feeding mechanism per piece.

The Roller Feed proper consists of a pair of rollers mounted at the end of the spindle. The mechanism is set to operate simultaneously with the opening of the work chuck, at which time the feed roller is set in motion, and the rod fed through the spindle and up to the stock stop.

The Timing Unit, mounted on a bracket on the back of the machine, above the rear cross slide, operates the swing stop. This mechanism consists primarily of a ratchet disk, dog carrier, adjustable dogs and a trip lever which releases the swing stop. Its purpose is to properly position the rod, through the medium of the swing stop, in order to obtain the minimum waste. The swing stop functions only for the first cut on each rod, which squares the end. After the first cut is completed, the rod on subsequent cuts is fed forward by the roller feed, to the stock stop of the machine, which is set for the required length of the piece.

Shipping weight: No. 00 Machines, 50 lbs.; No. 0 Machines, 90 lbs.; No. 2 Machines, 130 lbs.

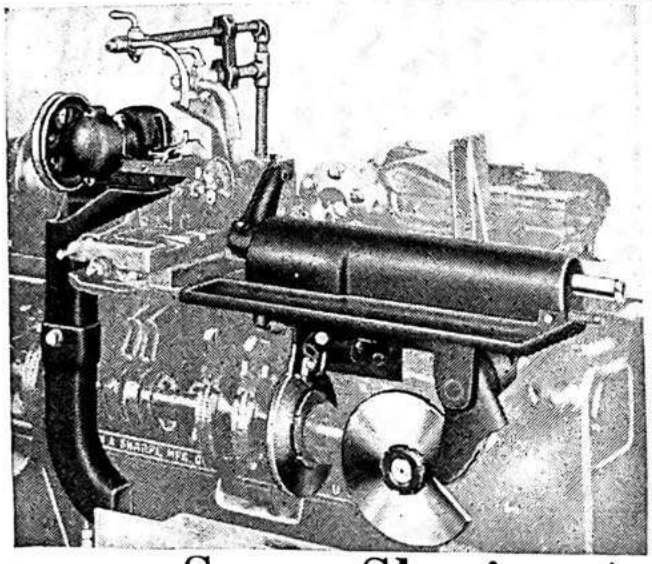
Standard Sets of Tools

For Use on Wire Feed Screw Machines

These tools are suggested as best fitting the machines to handle average work. Itemized list for any machine sent on request.

Screw Slotting Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming, and Cutting-Off Machines, and High Speed Machines of these sizes.



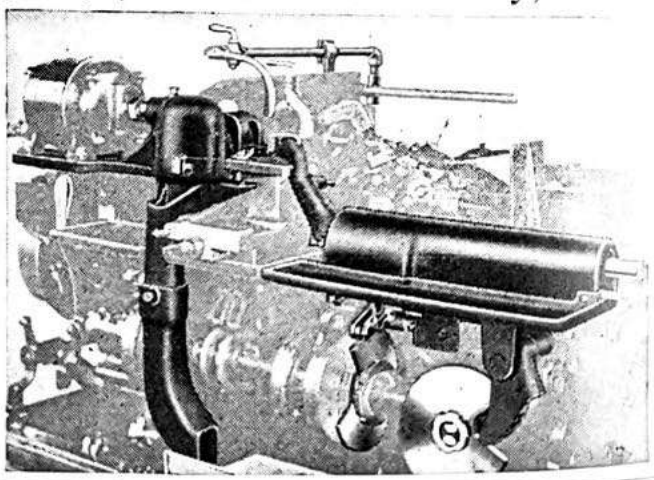
This attachment will take screws or similar pieces as they are cut off by the machine and slot them automatically. The saw is mounted on a slide and driven by a round belt from the overhead works or from an attachment driving stand. (See table below for capacities.)

Screw Slotting Attachments

For Motor Drive Only

For Nos. 00G, 0G and 2G Automatic Screw Machines and Nos. 00G, 0G and 2G Automatic Screw, Turret Forming, and Cutting-Off Machines (High Speed) (For Motor Drive Only)

This attachment is similar in design to the belt driven type. A ¼ H.P. (A.C.) or ⅛ H.P. (D.C.) motor furnishes power to drive the saw of the attachment through a pair of spiral gears. Additional gears furnished provide two speeds for slotting. Other speeds can be obtained through special gears.



Machine where used	Size of Work		Size of Saw		Shipping Weight, Lbs.
	Diameter, Inches	Length, Inches	Diameter of Hole, Inches	Diameter of Saw, Inches	
00, 00G	5/16	7/8	5/8	1 3/4	60
0, 0G	1/2	1 3/4	5/8	2 1/4	105
2, 2G	5/8	2 1/4	3/4	2 3/4	165

It is recommended that these attachments be fitted to the machine before leaving the factory.

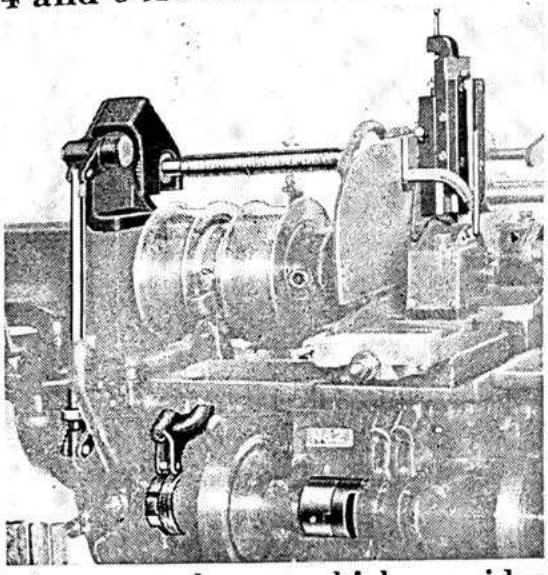
Slabbing Holders

For Use with Screw Slotting Attachments

When two saws are mounted in the Screw Slotting Attachments, the Slabbing Holder is used to keep sufficient tension on the work to prevent it turning should one saw strike the piece in advance of the other.

Vertical Slides

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes. Also Nos. 00 and 00G Automatic Screw Threading Machines (High Speed) and Nos. 4 and 6 Automatic Screw Machines



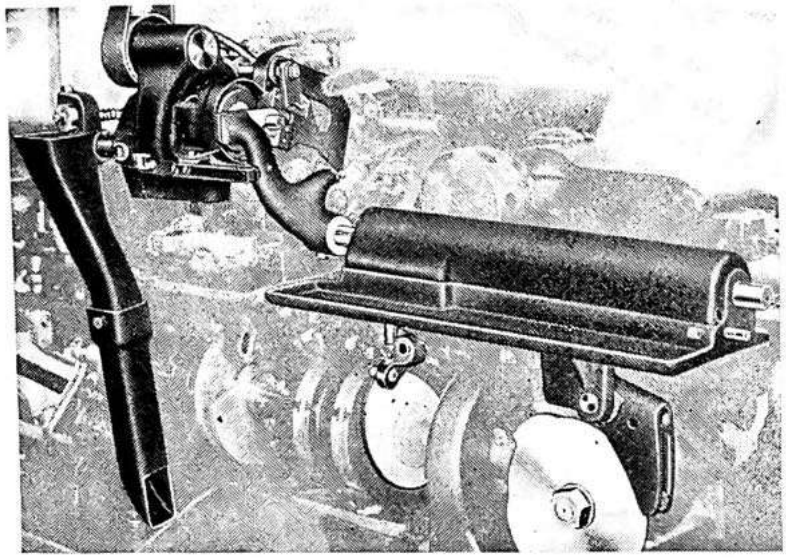
The Vertical Slide is an attachment which provides an additional tool slide, and on certain classes of work makes possible an appreciable increase in production. It is designed primarily for use with a cutting-off tool to take the place of a swing tool or a cross slide tool for cutting off and forming in shoulders where it is impossible many times to operate under ordinary conditions; leaving both cross slides free to be used for forming, thread rolling, knurling or other similar operations. The Vertical Slide may be used also for carrying forming, knurling, thread rolling or other tools usually carried by front or rear cross slides. A slight transverse and vertical adjustment is provided and cutting-off can be accomplished with the spindle running in either direction.

Shipping Weight: No. 00 Machines, 40 lbs.; No. 0 Machines, 56 lbs.; No. 2 Machines, 78 lbs.

On the Nos. 4 and 6 Machines the Vertical Slide must be fitted to the machine, and on the other sizes it is recommended that the Vertical Slide be fitted to the machine, before leaving the factory.

Nut Tapping Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes. Also Nos. 00 and 00G Automatic Screw Threading Machines (High Speed)



The attachment consists of a transporting arm which picks up the piece as it is cut off and carries it to an intermediate spindle where a countersinking operation is done on the back end, thence to the tapping unit proper. Here the nut is placed in a revolving chuck and automatically rotated over a bent shank tap. As successive nuts are fed on, those previously tapped are pushed along the shank and dropped off the end into the chute which leads to the work pan.

The tap is held in position by the nuts, which, as they are fed along the shank, bear on two bushings. One bushing can be seen in the illustration at the top of the work chute.

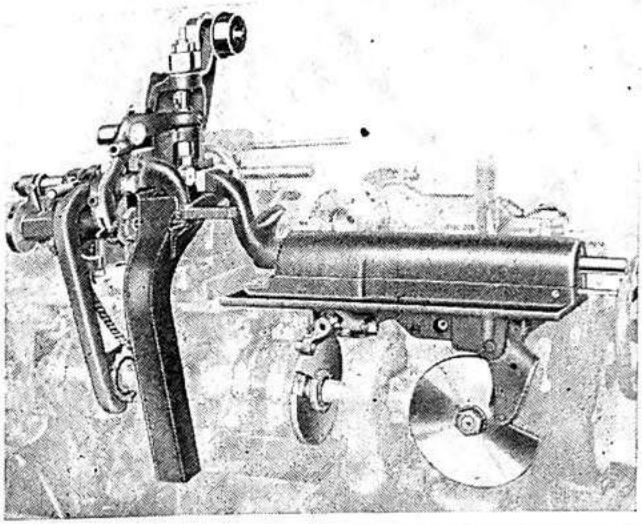
On belt driven machines this attachment is driven from overhead or from an Attachment Driving Stand. On motor driven machines it is driven by an individual motor.

The capacity is the same as for the machine on which the attachment is used.

Shipping Weight: No. 00 Machines, 95 lbs.; No. 0 Machines, 150 lbs.; No. 2 Machines, 240 lbs.

Index Drilling Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes. Also Nos. 00 and 00G Automatic Screw Threading Machines (High Speed)



This attachment is designed to drill automatically radial holes in binding posts, capstan screws, studs and similar automatic screw machine work. By its use the cost of drilling, and the time consumed, is practically the same as required to complete the piece without drilling, while the use of an extra machine is eliminated.

Machine where used	Diam. of Work, Inches	Length of Work, Inches	Diam. of Drill, Inches	Shipping Weight, Lbs.
00, 00G	3/8	1 1/8	3/32	112
0, 0G	1/2	1 3/4	5/32	178
2, 2G	7/8	2 1/4	1/4	250

Burring Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes. Also Nos. 00 and 00G Automatic Screw Threading Machines (High Speed)

This attachment takes pieces as they are cut off from the bar and with a single tool does light operations of countersinking and burring on the cut-off end of the work. It is similar, in general design and operation, to the Slotting Attachment.

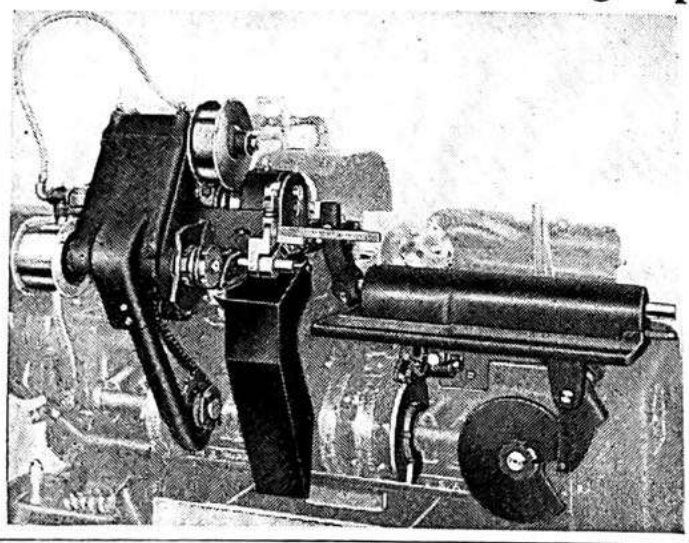
Machine where used	Diameter of Work, Inches	Length of Work, Inches	Shipping Wt., Lbs.
00, 00G	5/16	1	59
0, 0G	1/2	1 1/2	104
2, 2G	7/8	2 1/2	160

It is recommended that these attachments be fitted to the machine before leaving the factory.

Attachment Driving Stands for above, page 218.

Rear End Threading Attachments

For Nos. 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes



The Rear End Threading Attachment is designed to thread the rear or cut-off end of pieces, as automobile cylinder head studs, etc.

With the addition of this attachment the operation of threading the rear end is completed in practically the same time consumed in making the piece, and the necessity of an extra machine is eliminated.

Machine where used	Thread	Max. Length, Inches		Shipping Wt., Lbs.
		Threads	Over All	
0, 0G	3/8"—16	7/8	2 1/2	240
2, 2G	9/16"—14	1 1/4	3 1/2	310

It is recommended that the attachment be fitted to the machine before leaving the factory.

Attachment Driving Stands for above, page 218.

Cross Drilling Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw Machines, and High Speed Machines of these sizes

This attachment is used for drilling a hole at right angles through the piece, as on binding posts, studs with cotter pin holes, etc. It consists of a drill spindle with thrust washers of bronze and hardened steel, driven from the overhead works by a round belt, and can be quickly attached to the back cross slide.

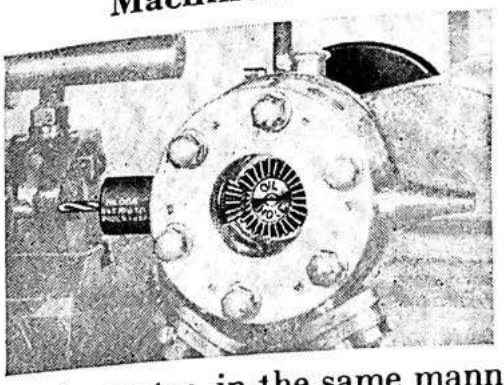
A brake is used on one of the machine spindle pulleys in place of a reverse belt to hold spindle stationary during drilling. The spindle brake is included with attachment. Drills are held in changeable bushings, one blank bushing being furnished.

Machine where used	Dia. of Drill, Inches	Shipping Wt., Lbs.
00, 00G	3/32	10
0, 0G (Direct Pulley Drive)	1/8	18
0, 0G (Geared Pulley Drive)	3/16	20
2, 2G	1/4	35

Attachment Driving Stands for above, page 218.

Drilling Attachments

For Nos. 00, 00G, 0, 0G, 2, 2G, 4 and 6 Automatic Screw Machines, Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Turret Forming Machines, and High Speed Machines of these sizes



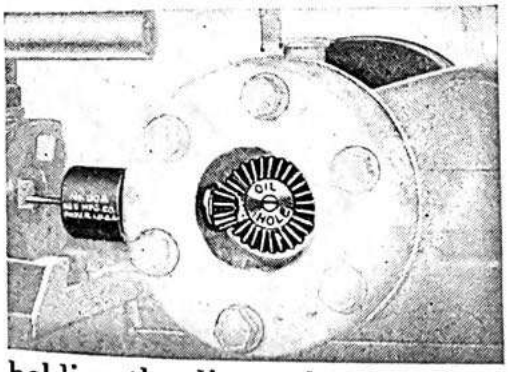
Small drills can often be run to advantage at faster speeds than the other tools in use. To accomplish this, a Drilling Attachment is used in the turret for rotating the drill in the opposite direction to the work. Several drills may be run at the same speed by meshing the bevel pinions on each drill spindle with the large bevel gear in the center, in the same manner as the single drill shown.

Machine where used	Diameter of Drill, Inches
00, 00G	1/16
0, 0G	3/32
2, 2G	1/8
4*	3/16
6*	1/4

*Driven by gears from the main driving shaft.

Tap or Die Revolving Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw Machines, and High Speed Machines of these sizes



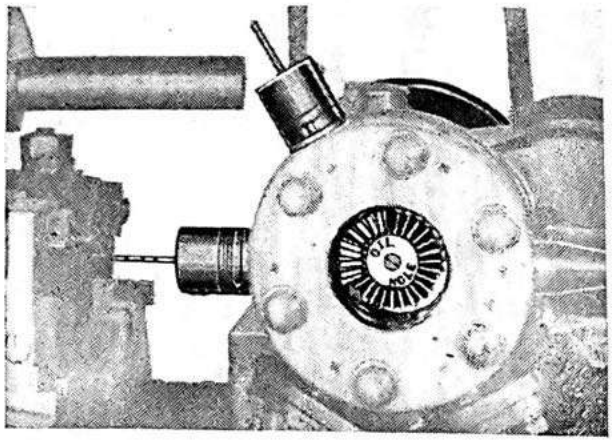
This attachment is for reducing the speed of the tap or die relative to the work when threading, and of increasing the speed when backing off the thread, without altering the speed of the work spindle. It is similar in design to the Drilling Attachment above, except the tool is rotated in the same direction as the machine spindle. For holding the dies a shank is furnished to insert in the tap holder.

Machine where used	Threads in Brass		Threads in Steel	
	Diameter, Inches	Threads per In.	Diameter, Inches	Threads per In.
00, 00G	5/32	36	1/8	40
0, 0G	1/4	32	3/16	36
2, 2G	3/8	24	1/4	32

Attachment Driving Stands for above, see next page.

Combination Drilling and Tapping Attachments

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw Machines, and High Speed Machines of these sizes



This attachment combines the advantages of both the Drilling and Tapping Attachments, and is similar in principle. The gear in the center of the turret meshes with the tap spindle, rotating it in the same direction as the work. The tap spindle gear, in turn, drives the drill spindle in the opposite direction to the work. Thus the threading speed is slower and the drilling faster than the balance of the operations.

The tap and drill are held in changeable bushings, one blank bushing being furnished in each holder.

Capacity:

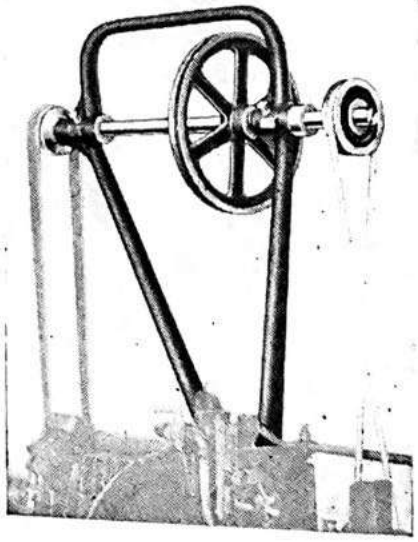
For Drilling, same as Drilling Attachment on page 217.

For Tapping, same as Tap or Die Revolving Attachment on page 217.

Attachment Driving Stands for above, see below.

Attachment Driving Stands

For Nos. 00G, 0G, and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes

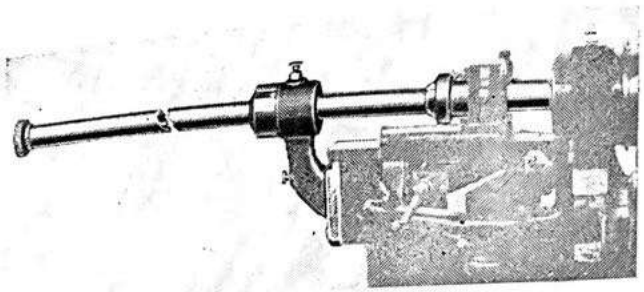


When Constant Speed Drive Automatic Screw, Turret Forming and Cutting-Off Machines are driven from the line shaft or a motor, and attachments usually driven from the countershaft are to be used, an Attachment Driving Stand (small auxiliary countershaft) is required on the machine. This applies to the Screw Slotting, Index Drilling, Cross Drilling, Nut Tapping, and Burring Attachments and the Turret Attachments shown on the preceding pages.

Shipping Weight: No. 00G Machines, 90 lbs.; No. 0G Machines, 92 lbs.; No. 2G Machines, 92 lbs.

Outside Feeding Attachments

For Nos. 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes



This attachment is designed to increase the range of the machine on light work, by allowing stock up to practically the full size of the hole in spindle to be fed. The feed tube is removed from within the spindle and a feeding finger, with interchangeable pads for different sizes of stock, is placed outside the spindle at the rear, being attached directly to the slide which ordinarily operates the feed tube.

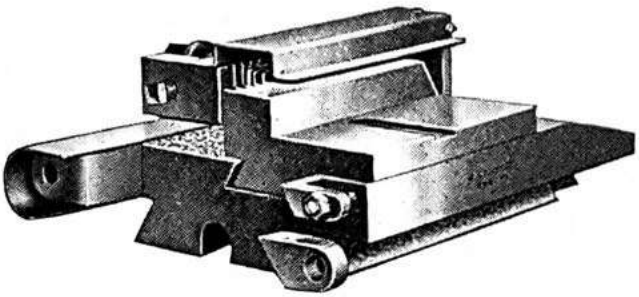
After the piece of stock becomes too short to be reached by the feeding finger, a bracket is swung into position and a pusher bar inserted, which forces the remaining stock through the spindle, using up the short length.

Master Feed Fingers with pads and collets furnished, unless otherwise specified, are ¾″ with attachment for Nos. 0 and 0G Machines, and 1¼″ with attachment for Nos. 2 and 2G Machines.

Shipping Weight: Nos. 0 and 0G Machines, 22 lbs.; Nos. 2 and 2G Machines, 35 lbs.

Double Movement Cross Slides

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes



This attachment is used in cases where a greater movement of the tool on the front cross slide is required than can be obtained by the cam. Its principal use is with Magazine Feeding Arrangements where a carrier on the cross slide takes each piece from the magazine to the spindle. It is substituted in place of the regular cross slide.

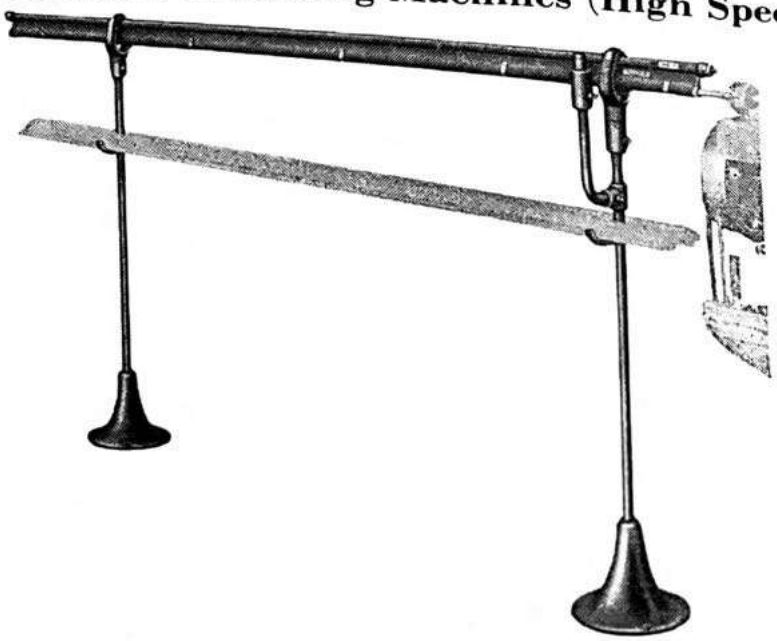
Arrangements for Oiling Through Turret Tools

For Nos. 2 and 2G Automatic Screw and Turret Forming Machines, and High Speed Machines of these sizes

By this attachment oil is carried from the regular supply pipe through the center of the turret, thence through the shank of the tool directly to the cutting point. Oil is shut off except when tool is in operating position. The attachment can be readily put on and removed.

Silent Stock Supports

For Nos. 00, 00G, 0, 0G, 2 and 2G Automatic Screw, Turret Forming and Cutting-Off Machines, and High Speed Machines of these sizes. Also Nos. 00 and 00G Automatic Screw Threading Machines (High Speed)



Objectionable noise created by stock revolving in the stock tube of an Automatic Screw Machine is practically eliminated by this new type Silent Stock Support which is readily installed in place of the Wire Stands generally used. Stock can be taken up to the capacity of the machine.

A vacuum type compressor greasing gun is furnished for periodic lubrication of the stock as it rotates in the flexible metal guide.

If customer desires to use his present stands, stand pipes and stock hooks, the Silent Stock Support can be furnished with these items or greasing gun omitted.

Machine where used	Length of Bar, Feet	Floor Space, Inches			Weight, Lbs.	
		Width	Height	Length	Net	Shipping
00, 00G	12	9	49 ¼	126	67	100
0, 0G	12	9	49 ¼	126	75	110
2, 2G						

Miscellaneous Machines, Etc.

B·S

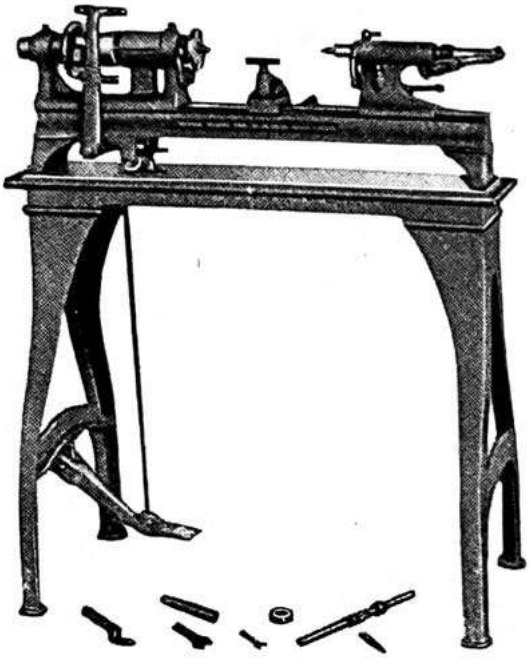
Universal Hand Lathe

Polishing and Finishing Machine

Screw Slotting Device

Sign Letters

Universal Hand Lathe



The Universal Hand Lathe is a very handy machine for light work.

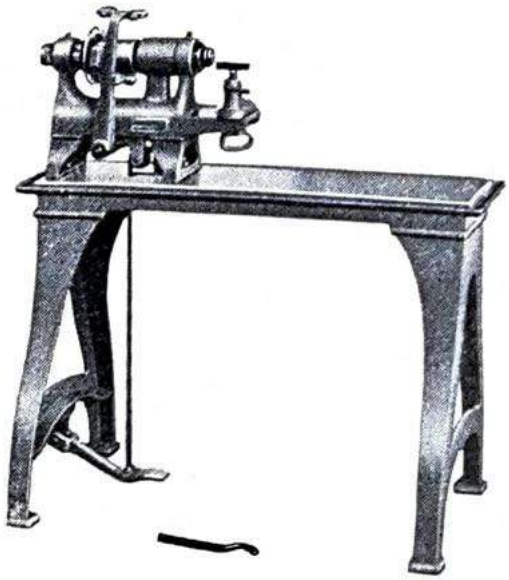
Capacity	Swing over bed . . . . diam., inches	9
	Swing over tool rest . . . . diam., inches	5¾
	Distance between centers . . . . inches	14½
	Power required . . . . H.P.	½
Spindle	Hole through . . . . diam., inches	½
	Front end {Threaded	16 R.H.
	Front end {Diameter . . . . inches	1⅛
	Collet has taper hole . . . . No.	3
	Number of changes of speed	6
	Range of speed . . . . r.p.m.	310 to 6335
Shell Chuck	Self-adjusting . . . . diam., inches	¼
	Belt shifted and brake applied simultaneously with opening of chuck.	
Footstock Spindle	Taper hole . . . . No.	3
Countershaft	Pair tight and loose pulleys . . . . diam., inches	6
	Belt width . . . . inches	2
	Speed . . . . r.p.m.	300
Floor Space	Right angles to spindle . . . . inches	25
	Parallel to spindle . . . . inches	53
Weights (Approx.)	Net . . . . lbs.	525
	Shipping . . . . lbs.	675
Equipment	¼″ self-adjusting shell chuck, collet for headstock spindle, tool holder, face plate, tool rest, wrenches, and everything else shown in cut, together with overhead works.	

Furnished as Extra—

Slide Rest	Center Rest
Shell Chucks	1/16″ to ⅜″ inclusive, varying by 1/32″, are kept in stock. Price each, $6.00. Intermediate sizes and Shell Chucks for holding disks made to order.

Polishing and Finishing Machine

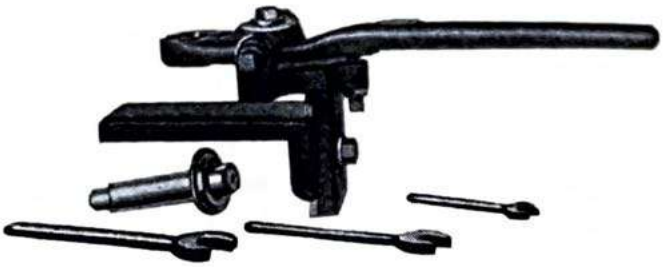
The Polishing and Finishing Machine is equipped with a spring chuck, controlled by a foot pedal, which simultaneously engages the driving pulley and permits the operator to use both hands. The machine is used in many shops for polishing and finishing operations on studs, screws, etc., of all kinds.



Capacity	Swing over rest . . . . . diam., inches	9¼
	Power required . . . . . H.P.	½
Spindle	Hole through . . . . . diam., inches	½
	Speed . . . . . r.p.m.	2100
Spring Chuck	Self adjusting . . . . . diam., inches	¼
	Foot pedal simultaneously opens chuck, shifts belt and applies brake.	
Table	Length . . . . . inches	39¼
	Width . . . . . inches	11⅞
	Working surface . . . . . inches	36½ x 9⅛
Countershaft	Pair tight and loose pulleys . . . . . diam., inches	6
	Belt width . . . . . inches	2
	Speed . . . . . r.p.m.	450
Floor Space	Right angles to spindle . . . . . inches	20
	Parallel to spindle . . . . . inches	40
Weights (Approx.)	Net . . . . . lbs.	360
	Shipping . . . . . lbs.	500
Equipment	¼″ spring chuck, tool rest, wrench and everything else shown in cut, together with overhead works.	
	Furnished as Extra—	
Spring Chucks	1/16″ to ⅜″ inclusive, varying by 1/32″, are kept in stock. Price each, $6.00. Intermediate sizes and Shell Chucks for holding disks made to order. Chucks are interchangeable with those for Universal Hand Lathe.	

Screw Slotting Device

For use on Lathes



The device shown above can be attached to an ordinary hand lathe and often eliminates the necessity of more expensive machines used for slotting the heads of screws. The knee is clamped to the bed of a hand lathe by a bolt, the operating lever projecting to the front at right angles to the bed. An arbor carrying a screw slotting cutter is held between the centers of the lathe. The lever is moved horizontally to open the jaws for inserting the studs and screws and then downward to bring them against the cutter which is kept in motion. The stop screw beneath the lever governs the depth of slot. The working part of the device can be raised or lowered on the knee and clamped by means of a bolt.

Capacity	Greatest distance from top of bushing in jaws to top of knee . . . . . inches	3¾
Jaws	Fitted to receive hardened steel split bushings for screws to . . . . . diam., inches	⅝
Weights (Approx.)	Net . . . . . lbs	25
	Shipping . . . . . lbs	33
Equipment	½″ bushing for jaws, 1″ screw slotting cutter arbor, No. 12 screw slotting cutter and wrenches.	

Furnished as Extra—

Hardened steel split bushings made to order. In ordering, give diameter of screw to be slotted in thousandths of an inch, or if gage numbers are used, specify the gage.

Sign Letters

Cast Iron Sign Letters in 4 ft. and 5 ft. sizes are made in full sets of alphabets and figures.

These letters are light in weight and having beveled edges are exceptionally attractive in appearance. They can be easily set up and are readily shifted to a new location if desired.

Send in sketch of dimensions of the wall or space you have available for a sign and we will be glad to quote full particulars.

Special leaflet completely describing Brown & Sharpe Sign Letters sent on request.

Machinists' Tools

B·S

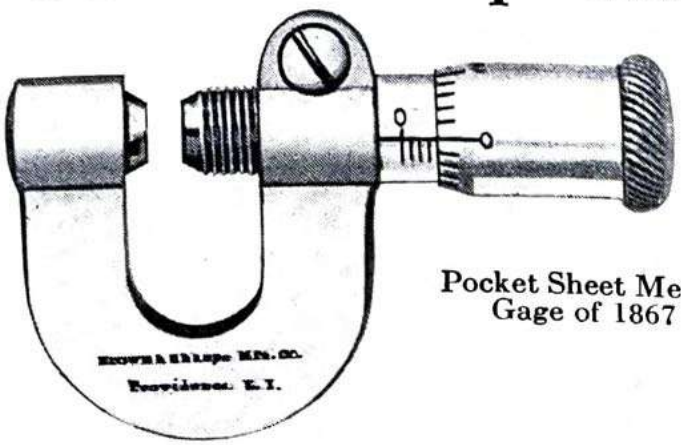
Brown & Sharpe Tools

are

"World's Standard of

Accuracy"

The First Practical Micrometer —a Brown & Sharpe Tool



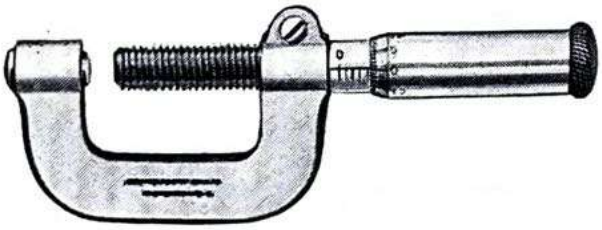
Pocket Sheet Metal Gage of 1867

WE must go back about ninety years to find the prototype of the Micrometer of today in a tool known as "Système Palmer," patented in France in 1848. Messrs. J. R. Brown and Lucian Sharpe saw this tool during their visit to the Paris Exposition in 1867 and were impressed with the fact that it might help to solve a problem which had come to their attention earlier that year.

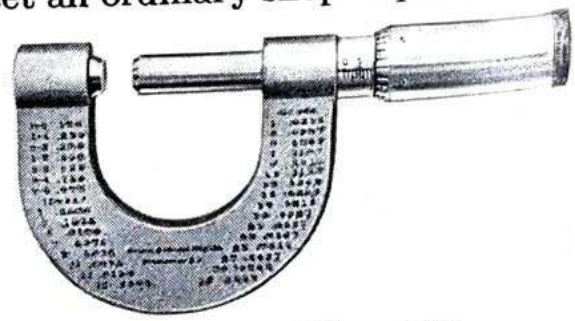
Before their departure for Europe, an American brass manufacturer, who had had a shipment returned as "out of gage" and had found that no two of the three standard gages then in use agreed on the brass in question, had sent a sketch of a proposed measuring tool to J. R. Brown and Sharpe for experimental work. The tool was not of value commercially, as it could not be read easily, but there was evidently a need for better means of measuring sheet metal.

Upon their return from Paris, Messrs. Brown and Sharpe introduced the "Pocket Sheet Metal Gage" (shown above), adopting a system of graduations similar to that of the Palmer tool and adding means of compensating for wear of measuring surfaces and screw. This was the first practical micrometer.

From this beginning and from ideas worked out in its own shops and through acquired patents, the Brown & Sharpe Mfg. Co. has increased its line to include about four hundred different Micrometer Calipers which are carried in stock and to meet all ordinary shop requirements.



Micrometer Caliper of 1877



Improved Micrometer Caliper of 1885

Sectional View of Micrometer Caliper

Features of Brown & Sharpe Micrometer Calipers

1. Materials

Materials are selected and tested to conform to our rigid high standards. Whenever practicable, measuring points are special analysis wear resisting high carbon, high chromium steel which gives enduring accuracy under severe and constant use.

2. Adjustable Thimble

The Patented Adjustable Thimble provides the simplest, most reliable adjustment. It keeps the graduations in their original positions, and is positively locked.

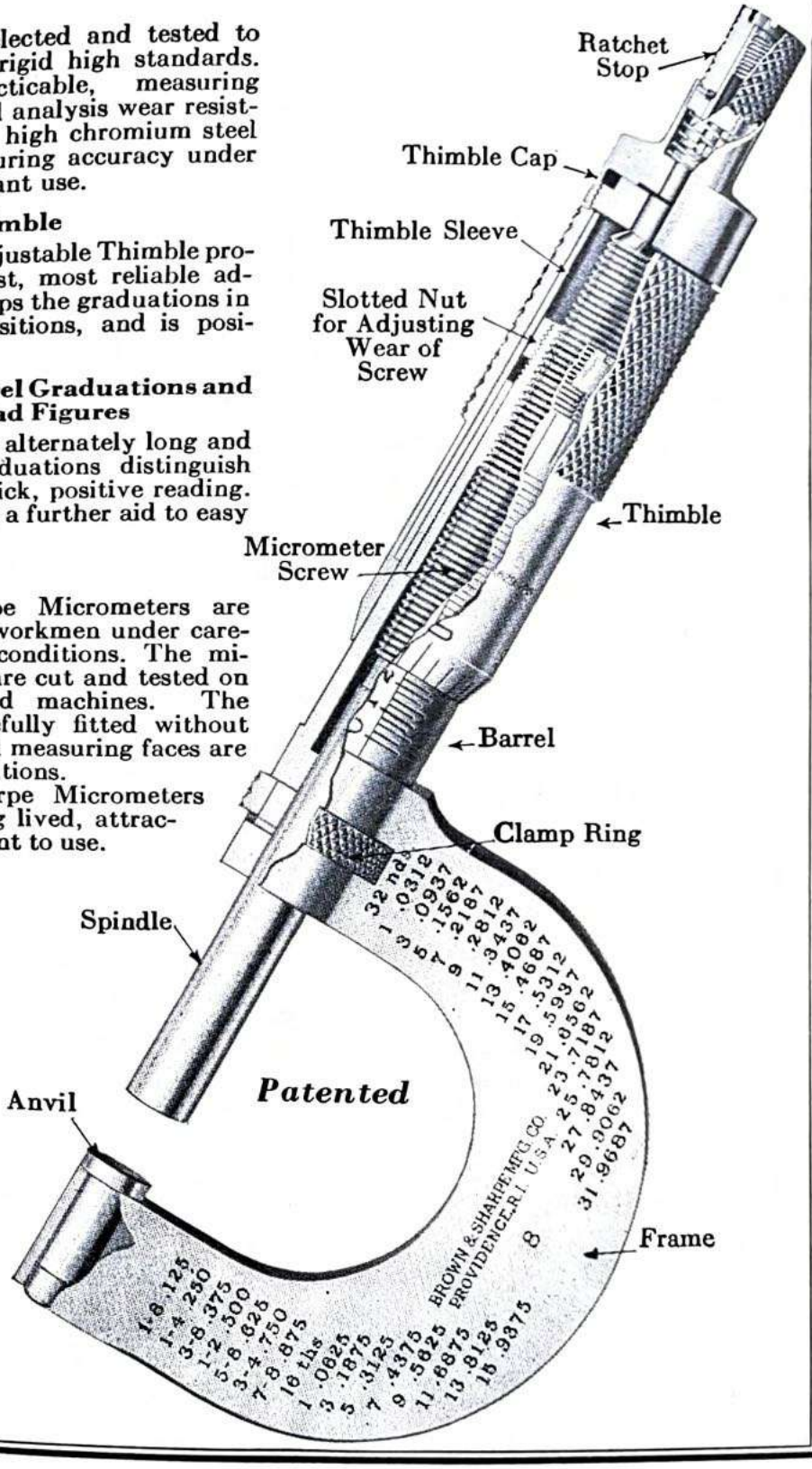
3. Distinctive Barrel Graduations and Large Easily Read Figures

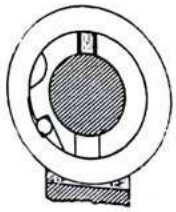
On many models alternately long and short barrel graduations distinguish each .025″ for quick, positive reading. Larger figures are a further aid to easy reading.

4. Manufacture

Brown & Sharpe Micrometers are made by skilled workmen under carefully controlled conditions. The micrometer screws are cut and tested on specially designed machines. The spindles are carefully fitted without bind or shake and measuring faces are parallel in all positions.

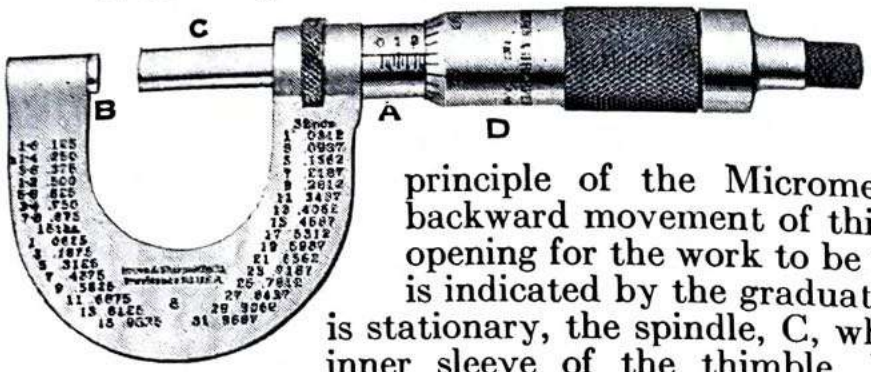
Brown & Sharpe Micrometers are accurate, long lived, attractive and convenient to use.





Sectional View of Clamp Ring

Principle of the Micrometer Caliper



A Screw free to move in a fixed nut is the chief mechanical principle of the Micrometer Caliper. The backward movement of this screw affords an opening for the work to be measured; the size is indicated by the graduations. As the frame is stationary, the spindle, C, which is attached to inner sleeve of the thimble, D, approaches or recedes from the anvil, B, when the thimble is revolved. The graduations on barrel, A, are in a line parallel to the axis of the screw and conform to the pitch of the screw. The beveled edge of the thimble, D, carries graduations which enable readings in one-thousandths of an inch and hundredths of a mm to be taken.

Standards

WE make our own Standards which are frequently checked with those of the U. S. Bureau of Standards, which are the only standards we recognize.

Ratchet Stop

THE Ratchet Stop, which can be furnished with most of our Micrometer Calipers, eliminates any difference in personal touch and provides the same pressure for every measurement.

In the new Brown & Sharpe design a full spiral spring holds two members of an overriding clutch together, and provides an exceptionally smooth action, a real advantage for accurate measurements. The Ratchet Stop is positive in its return. The full spiral spring and well proportioned parts are designed to give long, trouble-free operation.

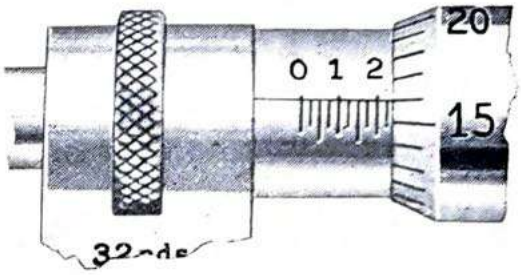
Clamp Ring

THE Clamp Ring, a device originally patented by the Brown & Sharpe Mfg. Co., locks the spindle in position and preserves the setting. A slight turn on the knurled ring firmly locks the spindle by tightening an inner band circling the spindle, the inner band being held from turning. The Brown & Sharpe Clamp Ring does not cramp the spindle and force it to one side. The spindle is never forced out of line.

Special Micrometers

IN addition to the stock micrometers listed on the following pages, we are prepared to furnish tools with special anvils and spindles, or of completely special design, for customers' particular requirements.

How to Read Micrometers Graduated to Thousandths of an Inch

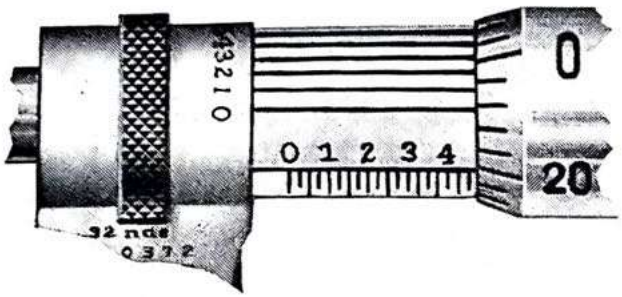


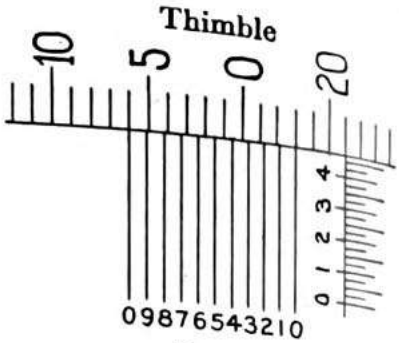
THE customary pitch of the screw is 1-40″ (40 threads to the inch). Thus, the distance traversed by the screw or spindle during one complete revolution is 1-40″ or .025″. As the graduations on the barrel conform to the pitch of the screw (40 to the inch), each division equals .025″ and every four divisions represent 0, .100″, .200″, etc. (10ths of an inch); each tenth of an inch is numbered 0, 1, 2, etc. The beveled edge of the thimble is graduated into 25 parts and figured every fifth division 0, 5, 10, 15 and 20. When 25 of these graduations have passed the horizontal line on the barrel, the spindle, having made one revolution, has moved .025″. Thus, when the spindle moves only far enough to cause one graduation to pass the horizontal line on the barrel, it will have moved 1-25 of .025″, or .001″. The distance between the graduations on the thimble is great enough to permit half and quarter thousandths of an inch to be readily estimated.

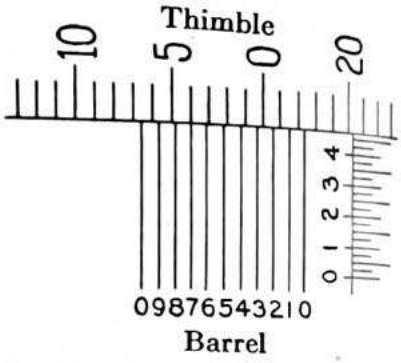
To read—First note the last figure visible on the scale on the barrel, representing the tenths of an inch. Multiply the number of divisions visible beyond this figure by 25 and add the number of the division on the scale on the thimble that coincides with the line of graduations on the barrel. Then this sum expressed in thousandths, added to the tenths shown, is the reading.

Example:—In the cut, shown above, .200″ (2-10″) is shown by the figures on the scale on the barrel and one graduation beyond a tenth graduation is also visible while on the bevel on the thimble the graduations show 16 divisions from the zero to the line coincident with the horizontal line on barrel. Then the reading = .200″ + .025″ + .016″ = .241″.

How to Read Micrometers Graduated to Ten-Thousandths of an Inch







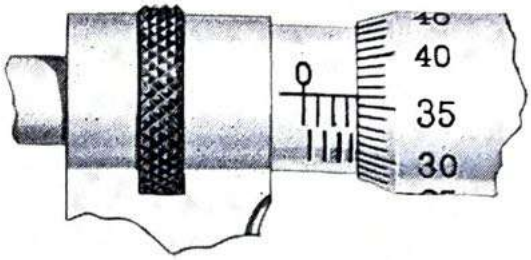
TO obtain readings in ten-thousandths of an inch a Vernier is employed on the barrel of the Micrometer Caliper*. The Vernier used consists of ten divisions, which equal, in over-all space, nine divisions on the thimble. Thus, one division on the Vernier $= 1/10 \times 9/1000'' = 9/10{,}000''$. Since each graduation on the thimble $= 1/1000''$ or $10/10{,}000''$, the difference in space between a division on the thimble and a division on the barrel $= 10/10{,}000'' - 9/10{,}000'' = 1/10{,}000''$. Since the two zero lines on the Vernier coincide with lines on the thimble when the reading is exact with respect to the number of thousandths, the difference between the lines on thimble and lines on Vernier at numbers 1, 2, 3, etc., equals .0001″, .0002″, .0003″, etc. Thus, when the 1st, 2nd or 3rd, etc., lines coincide, the thimble has moved past the exact zero setting 1, 2 or 3, etc., 10,000ths of an inch to bring these lines together.

To read—First obtain the reading for the thousandths in the manner described in the preceding section and then add the ten-thousandths, the number of which is indicated by the line on the Vernier which coincides with a line on the thimble.

Example:—As shown in upper line cut, there are no ten-thousandths to be added, for the two zeros on the Vernier coincide with lines on the thimble; the reading = .4690″. In the lower cut the 7th graduation on the Vernier coincides with a line on the thimble, indicating that 7 ten-thousandths should be added to the thousandths reading; the reading = .4690″ + .0007″ = .4697″.

*Micrometer Calipers Nos. 24, 24RS, 233RS and 240RS read ten-thousandths of an inch by methods other than described above.

How to Read
Micrometers Graduated for Metric Measure



THE customary pitch of the screw is ½ mm. Thus, the distance traversed by the screw or spindle during one complete revolution is ½ mm, or .50 mm, and two complete revolutions are required to move the spindle a distance of 1.00 mm. The graduations on the barrel conform to the pitch of the screw. The upper set of graduations, representing mm, is numbered every fifth graduation; the lower set of graduations subdivides each mm division into 2 equal parts. The beveled edge of the thimble is graduated into 50 parts and figured every fifth division 0, 5, 10, 15, 20, 25, 30, etc. When fifty of these graduations have passed the horizontal line on the barrel, the spindle, having made one revolution, has moved .50 mm. Thus, when the spindle moves only far enough to cause one graduation to pass the horizontal line on the barrel, it will have moved 1/50 of .50 mm, or .01 mm. The distance between the graduations on the thimble is great enough to permit half and quarter hundredths of a mm to be readily estimated.

To read—First note the last figure visible on the scale on the barrel representing a whole mm. Note whether or not a half mm division is visible beyond this graduation. Then determine the hundredths mm by the line on thimble coinciding with the horizontal line on the barrel. The mm shown (plus .50 mm if a half mm graduation shows), plus the number of hundredths of a mm, is the reading.

Example:—In cut above, 3 mm graduations are shown; also a ½ mm graduation is visible; on the bevel on the thimble the graduations show 36 divisions from the zero to the line coincident with the line of graduations on the barrel. Then the reading = 3.00 mm + .50 mm + .36 mm = 3.86 mm.

Micrometer Caliper No. 2

ENGLISH MEASURE
Range, 0 to 1-2″
by thousandths of an inch

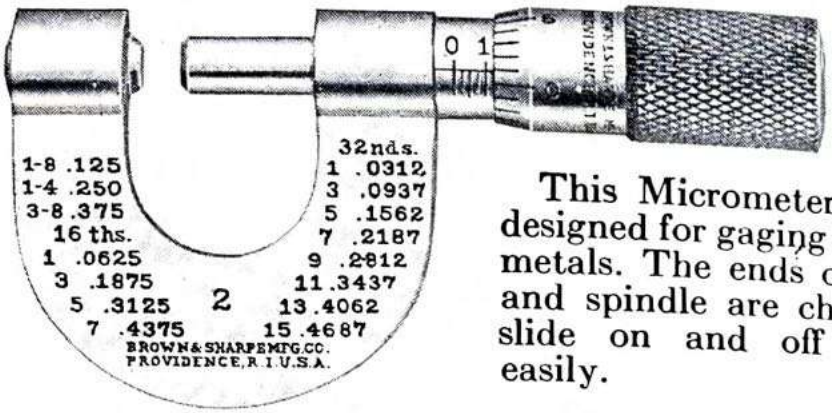
or

METRIC MEASURE
Range, 0 to 13 mm
by hundredths of a millimeter

Price, $7.00 Case, **$1.20**

2

2
RS



This Micrometer Caliper is designed for gaging rolled sheet metals. The ends of the anvil and spindle are chamfered to slide on and off the work easily.

Table of decimal equivalents omitted on Metric Micrometer.

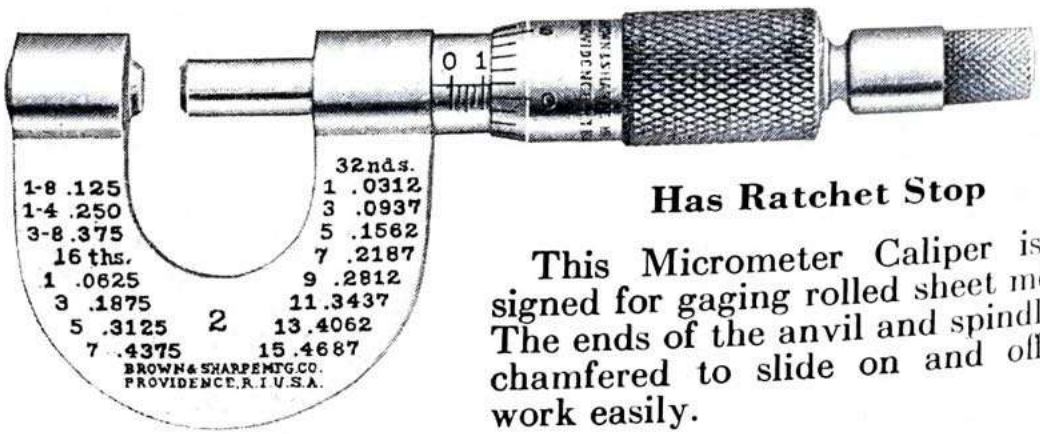
Micrometer Caliper No. 2RS

ENGLISH MEASURE
Range, 0 to 1-2″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 13 mm
by hundredths of a millimeter

Price, $7.50 Case, **$1.20**



Has Ratchet Stop

This Micrometer Caliper is designed for gaging rolled sheet metals. The ends of the anvil and spindle are chamfered to slide on and off the work easily.

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Caliper No. 4

ENGLISH MEASURE
Range, 0 to 1-2″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 13 mm
by hundredths of a millimeter

Price, $7.00 Case, **$1.20**

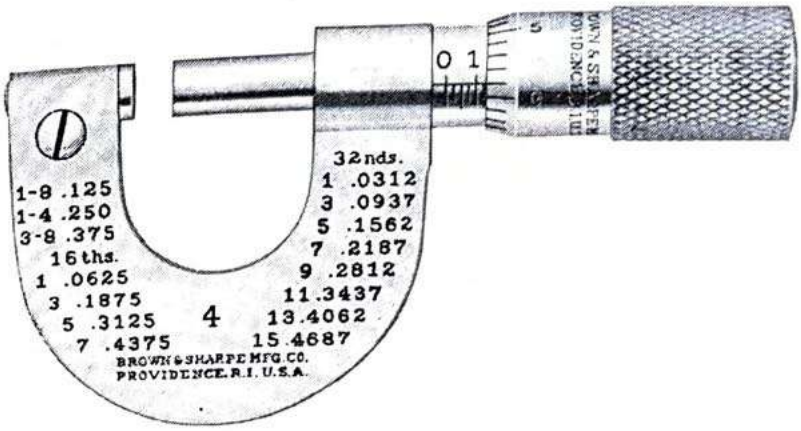


Table of decimal equivalents omitted on Metric Micrometer.

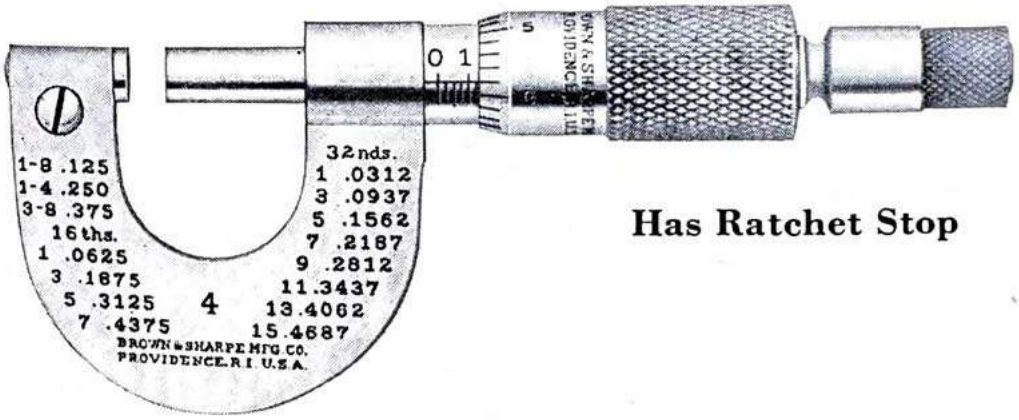
Micrometer Caliper No. 4RS

ENGLISH MEASURE
Range, 0 to 1-2″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 13 mm
by hundredths of a millimeter

Price, $7.50 Case, **$1.20**



Has Ratchet Stop

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Caliper No. 5

Patented

ENGLISH MEASURE
Range, 0 to 1-2″
by thousandths of an inch

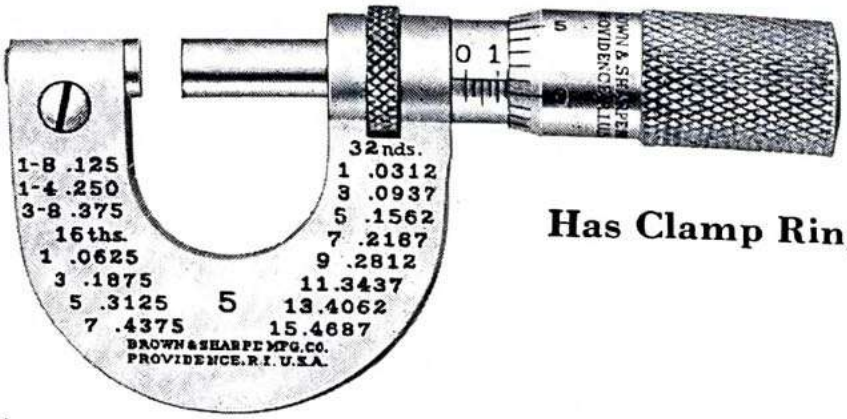
or

METRIC MEASURE
Range, 0 to 13 mm
by hundredths of a millimeter

Price, $8.00 Case, **$1.20**

5

5
RS



Has Clamp Ring

Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 5RS

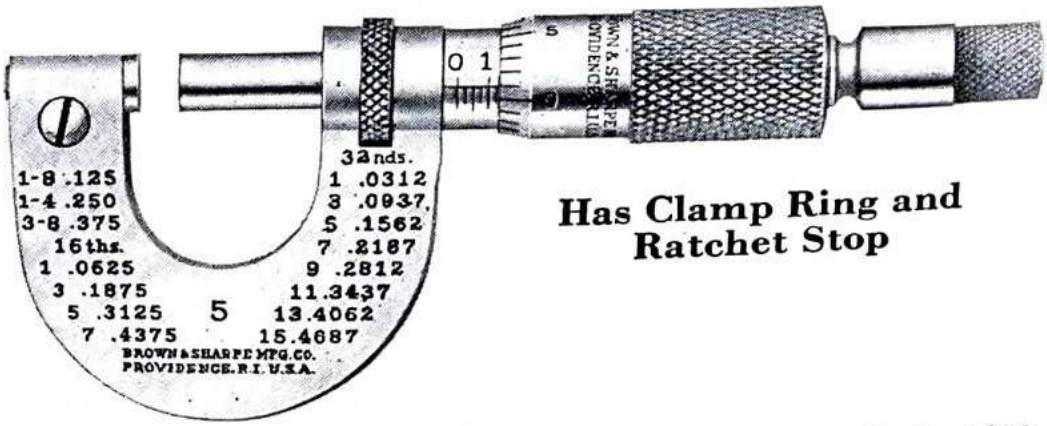
Patented

ENGLISH MEASURE
Range, 0 to 1-2″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 13 mm
by hundredths of a millimeter

Price, $8.50 Case, **$1.20**



Has Clamp Ring and Ratchet Stop

Table of decimal equivalents omitted on Metric Micrometer.

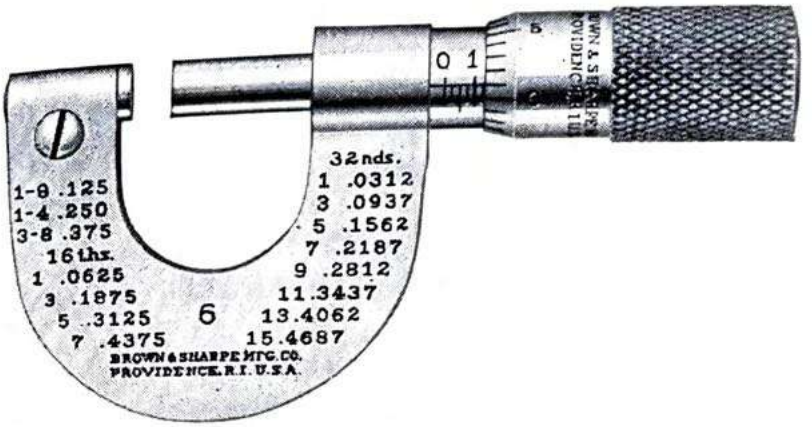
Each of the above packed one in a box.

Micrometer Caliper No. 6

Range, 0 to 1-2″

by **ten-thousandths** as well as thousandths of an inch

Price, $8.75 Case, **$1.20**



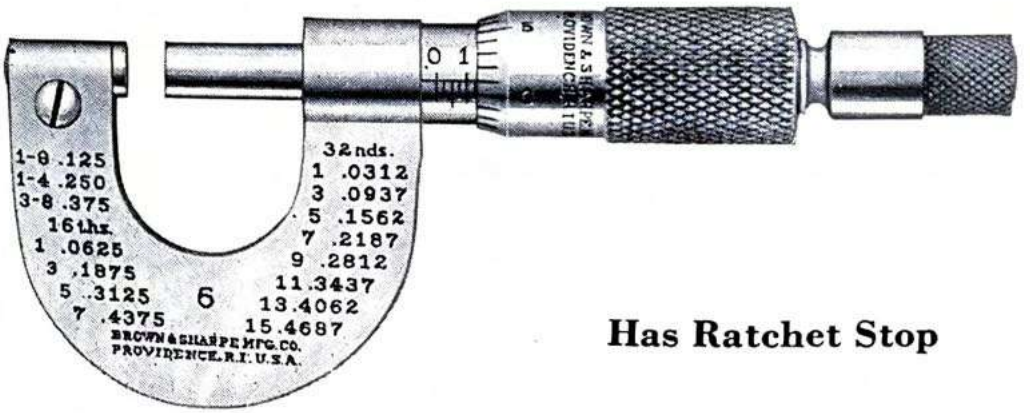
For reading Micrometer with ten-thousandths graduations, see page 230.

Micrometer Caliper No. 6RS

Range, 0 to 1-2″

by **ten-thousandths** as well as thousandths of an inch

Price, $9.25 Case, **$1.20**



Has Ratchet Stop

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box.

Micrometer Caliper No. 8

Patented

ENGLISH MEASURE or **METRIC MEASURE**

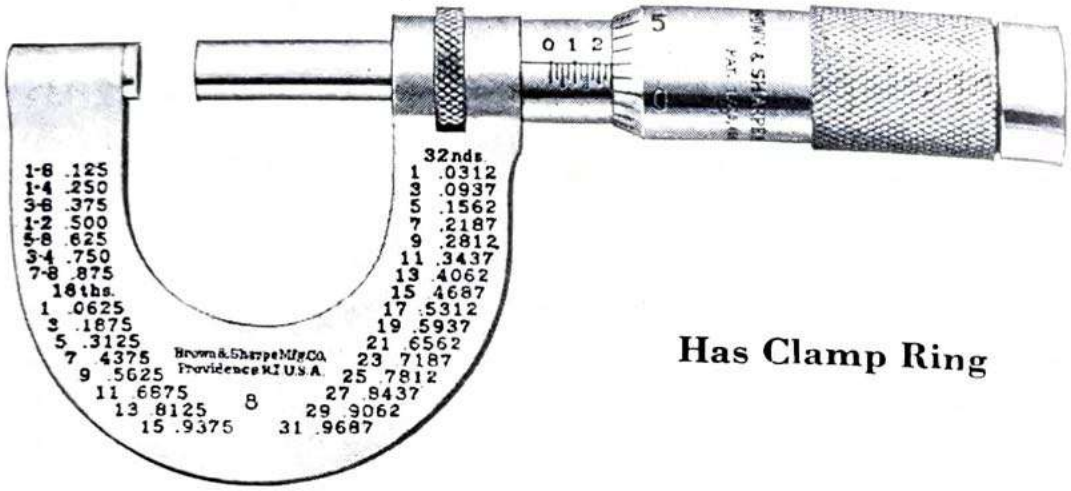
Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $9.50 Case, **$1.25**

8

8
RS



Has Clamp Ring

Table of decimal equivalents omitted on Metric Micrometer

Micrometer Caliper No. 8RS

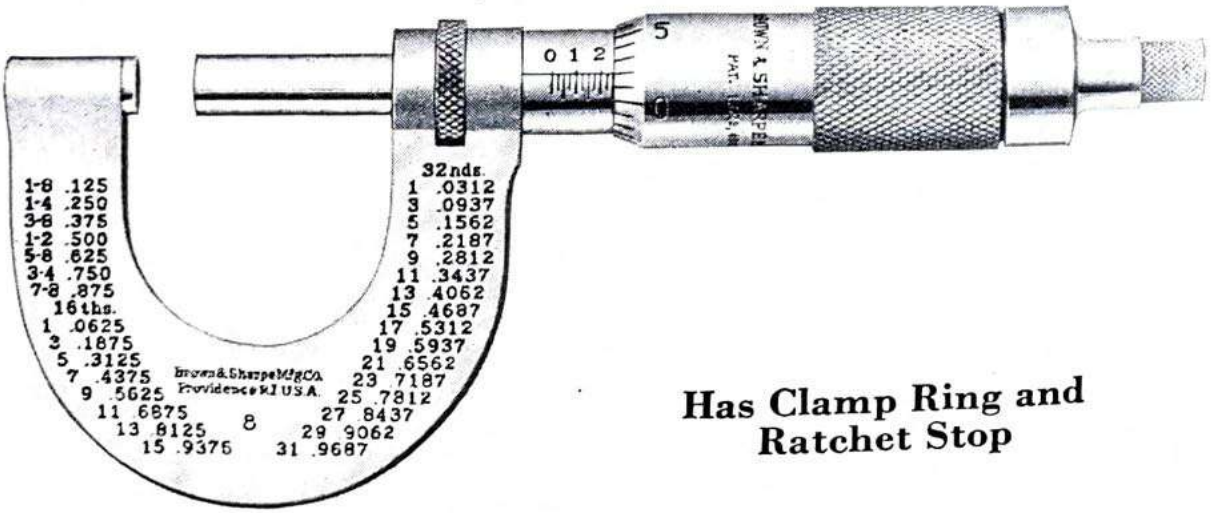
Patented

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $10.00 Case, **$1.25**



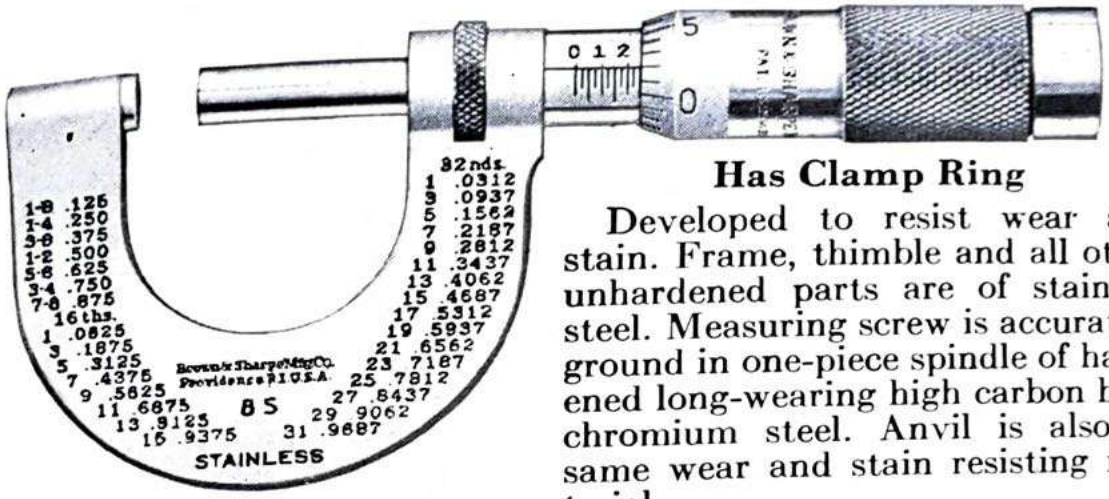
Has Clamp Ring and Ratchet Stop

Table of decimal equivalents omitted on Metric Micrometer.
Each of the above packed one in a box.

Micrometer Caliper No. 8S

Patented and Patent Pending

Range, 0 to 1″ by thousandths of an inch
Price, $12.75 Case, $1.25



8S

8S
RS

Has Clamp Ring

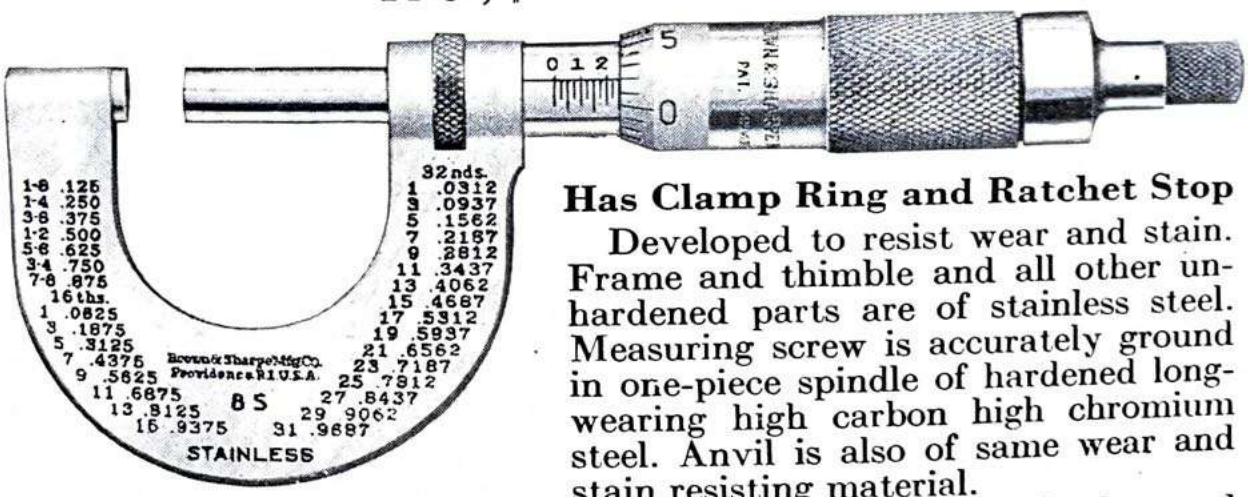
Developed to resist wear and stain. Frame, thimble and all other unhardened parts are of stainless steel. Measuring screw is accurately ground in one-piece spindle of hardened long-wearing high carbon high chromium steel. Anvil is also of same wear and stain resisting material.

Graduations on barrel and thimble are on non-reflecting background to facilitate reading.

Micrometer Caliper No. 8SRS

Patented and Patent Pending

Range, 0 to 1″ by thousandths of an inch
Price, $13.25 Case, $1.25



Has Clamp Ring and Ratchet Stop

Developed to resist wear and stain. Frame and thimble and all other unhardened parts are of stainless steel. Measuring screw is accurately ground in one-piece spindle of hardened long-wearing high carbon high chromium steel. Anvil is also of same wear and stain resisting material.

Graduations on barrel and thimble are on non-reflecting background to facilitate reading.

Each of the above packed one in a box.

Micrometer Caliper No. 10

Patented

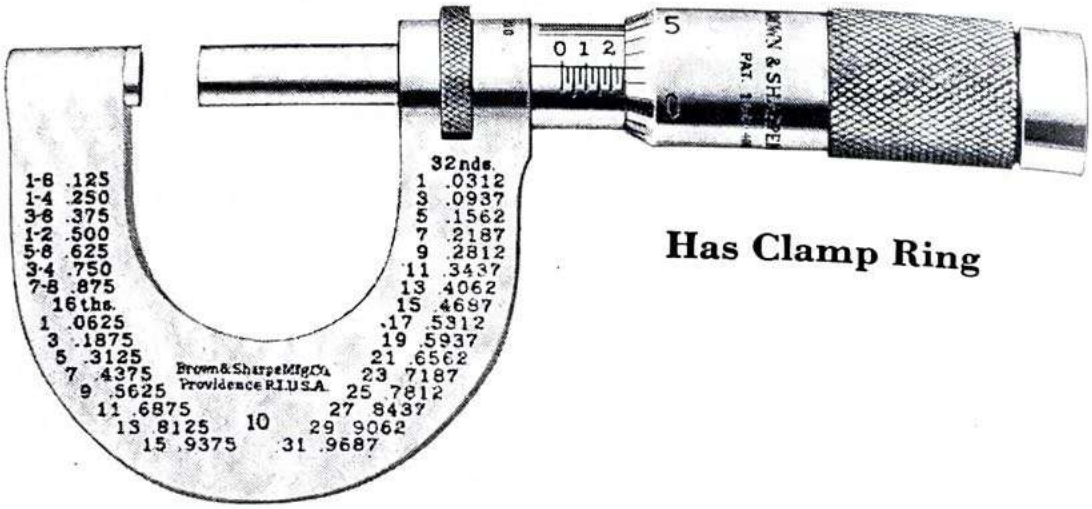
Range, 0 to 1″

by ten-thousandths as well as thousandths of an inch

Price, $11.25 Case, **$1.25**

10

10 RS



Has Clamp Ring

For reading Micrometer with ten-thousandths graduations, see page 230.

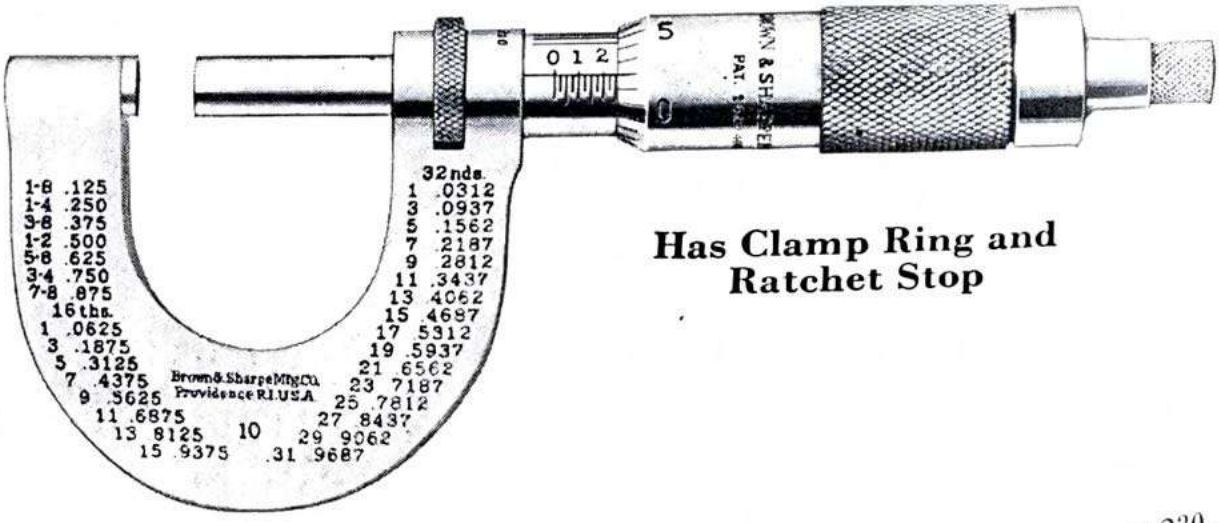
Micrometer Caliper No. 10RS

Patented

Range, 0 to 1″

by ten-thousandths as well as thousandths of an inch

Price, $11.75 Case, **$1.25**



Has Clamp Ring and Ratchet Stop

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box.

Micrometer Caliper No. 10S

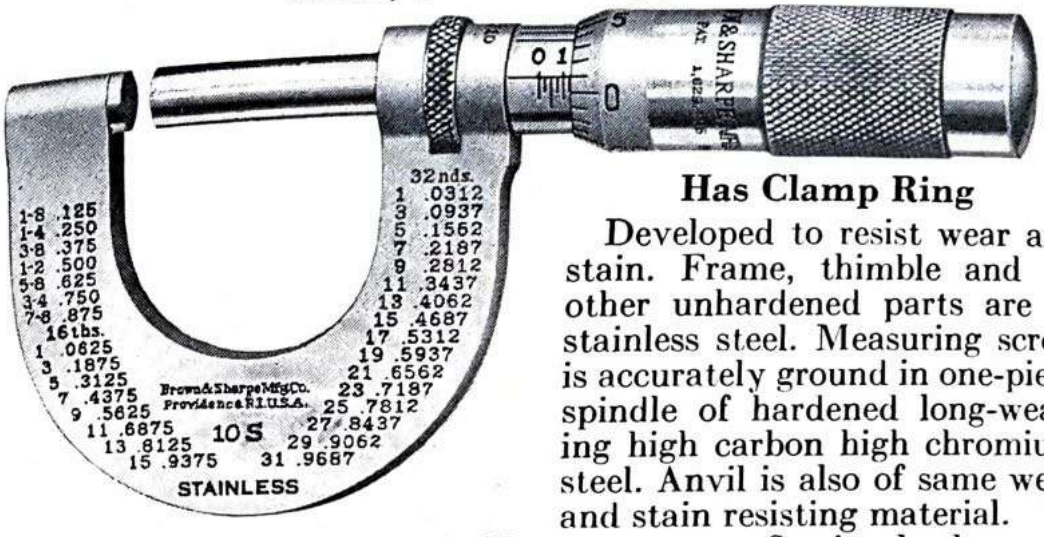
Patented and Patent Pending

Range, 0 to 1″

by ten-thousandths as well as thousandths of an inch

Price, $14.50 Case, **$1.25**

10S



10S RS

Has Clamp Ring

Developed to resist wear and stain. Frame, thimble and all other unhardened parts are of stainless steel. Measuring screw is accurately ground in one-piece spindle of hardened long-wearing high carbon high chromium steel. Anvil is also of same wear and stain resisting material.

Graduations on barrel and thimble are on non-reflecting background to facilitate reading.

For reading Micrometer with ten-thousandths graduations, see page 230.

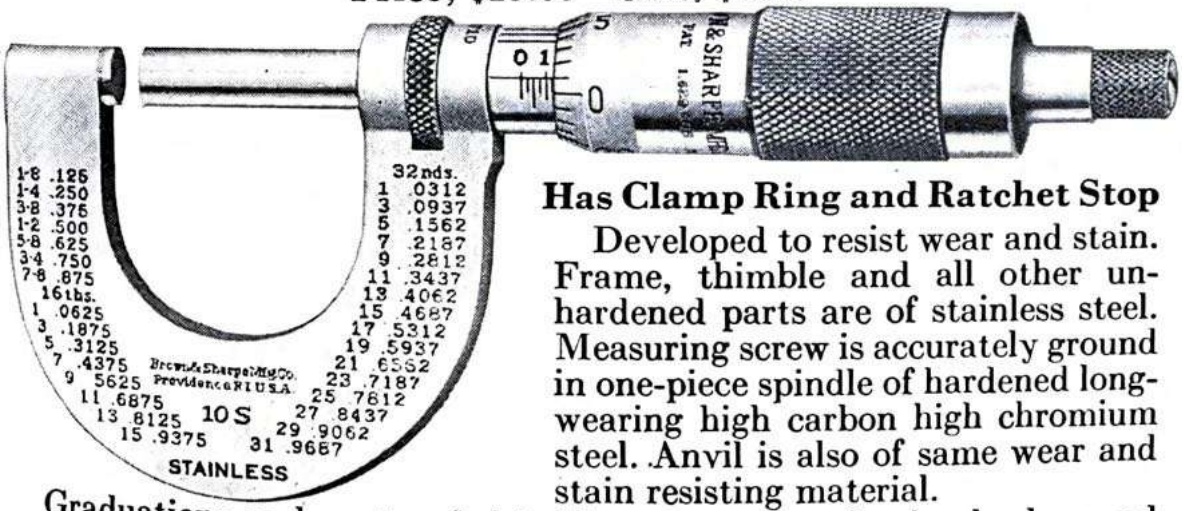
Micrometer Caliper No. 10SRS

Patented and Patent Pending

Range, 0 to 1″

by ten-thousandths as well as thousandths of an inch

Price, $15.00 Case, **$1.25**



Has Clamp Ring and Ratchet Stop

Developed to resist wear and stain. Frame, thimble and all other unhardened parts are of stainless steel. Measuring screw is accurately ground in one-piece spindle of hardened long-wearing high carbon high chromium steel. Anvil is also of same wear and stain resisting material.

Graduations on barrel and thimble are on non-reflecting background to facilitate reading.

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box

Micrometer Caliper No. 11

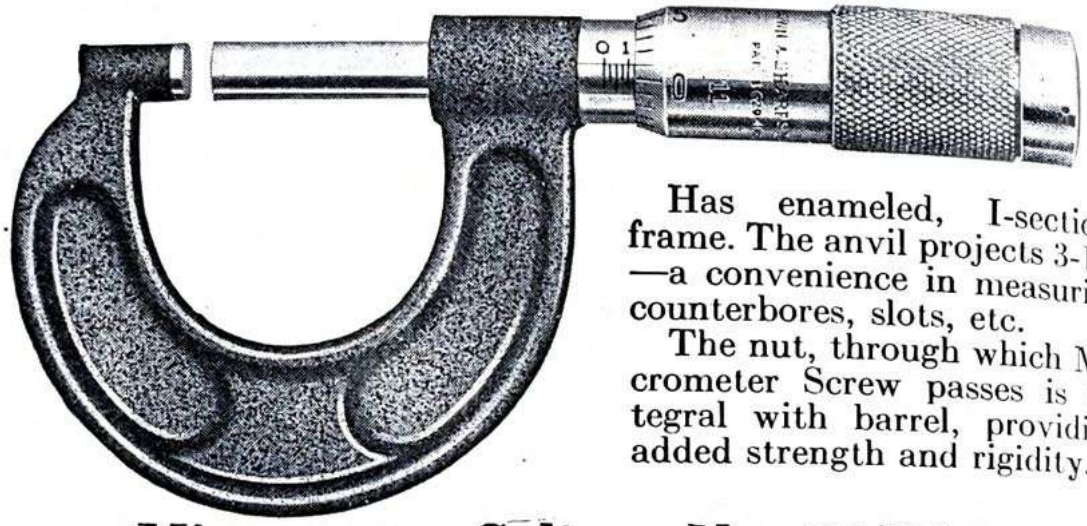
Patented

ENGLISH MEASURE or **METRIC MEASURE**
Range, 0 to 1″ — **Range, 0 to 25 mm**
by thousandths of an inch — by hundredths of a millimeter

Price, $6.25 Case, **$1.25**

11

11 RS



Has enameled, I-section frame. The anvil projects 3-16″—a convenience in measuring counterbores, slots, etc.

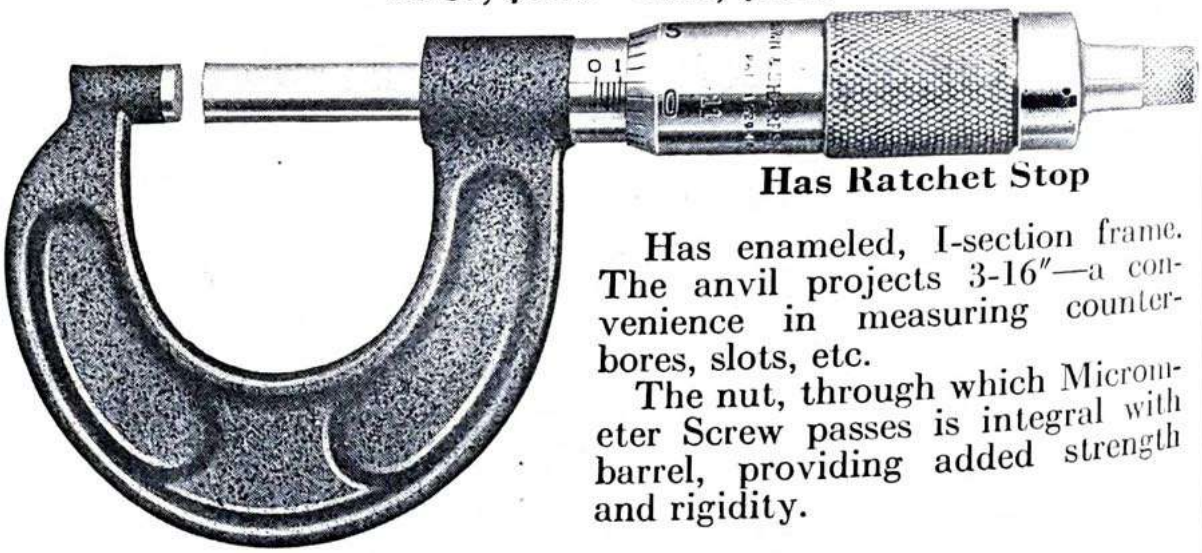
The nut, through which Micrometer Screw passes is integral with barrel, providing added strength and rigidity.

Micrometer Caliper No. 11RS

Patented

ENGLISH MEASURE or **METRIC MEASURE**
Range, 0 to 1″ — **Range, 0 to 25 mm**
by thousandths of an inch — by hundredths of a millimeter

Price, $6.75 Case, **$1.25**



Has Ratchet Stop

Has enameled, I-section frame. The anvil projects 3-16″—a convenience in measuring counterbores, slots, etc.

The nut, through which Micrometer Screw passes is integral with barrel, providing added strength and rigidity.

Each of the above packed one in a box.

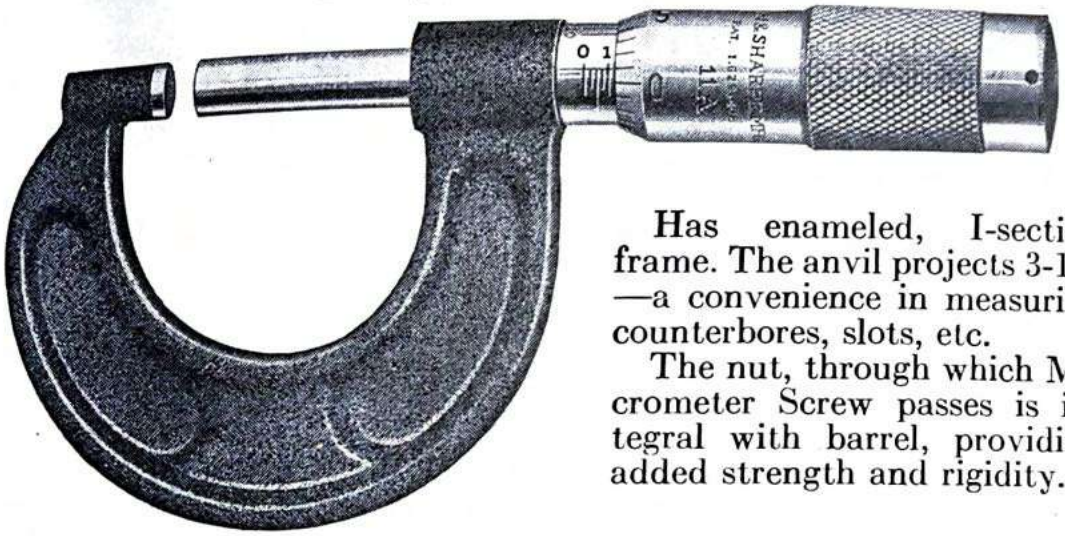
Micrometer Caliper No. 11A

Patented

Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $8.00 Case, **$1.25**



11A

11A RS

Has enameled, I-section frame. The anvil projects 3-16″—a convenience in measuring counterbores, slots, etc.

The nut, through which Micrometer Screw passes is integral with barrel, providing added strength and rigidity.

For reading Micrometer with ten-thousandths graduations, see page 230.

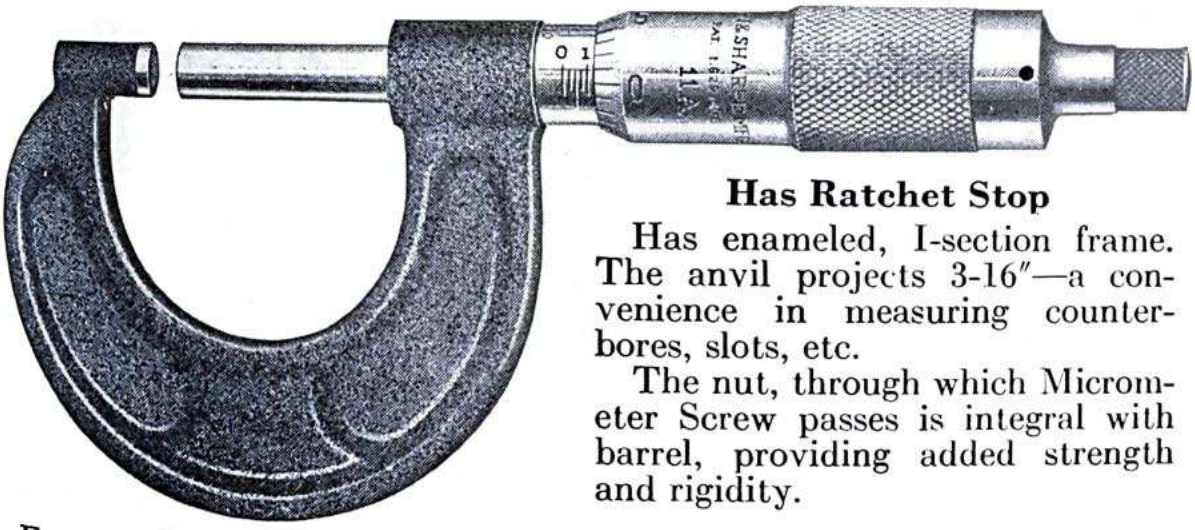
Micrometer Caliper No. 11ARS

Patented

Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $8.50 Case, **$1.25**



Has Ratchet Stop

Has enameled, I-section frame. The anvil projects 3-16″—a convenience in measuring counterbores, slots, etc.

The nut, through which Micrometer Screw passes is integral with barrel, providing added strength and rigidity.

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box.

Micrometer Caliper No. 12

Patented

ENGLISH MEASURE or **METRIC MEASURE**

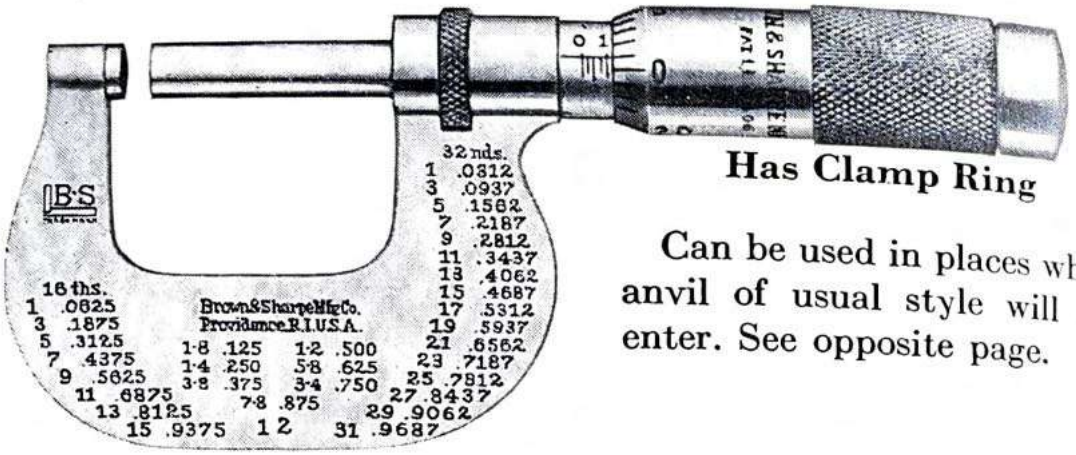
Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $9.50 Case, **$1.25**

12

12 RS



Has Clamp Ring

Can be used in places where anvil of usual style will not enter. See opposite page.

Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 12RS

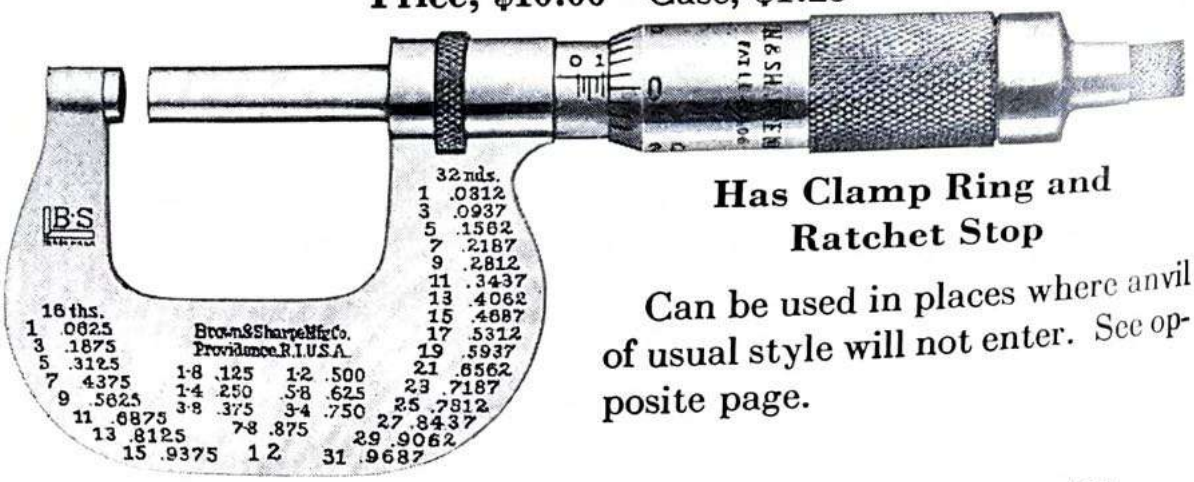
Patented

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $10.00 Case, **$1.25**

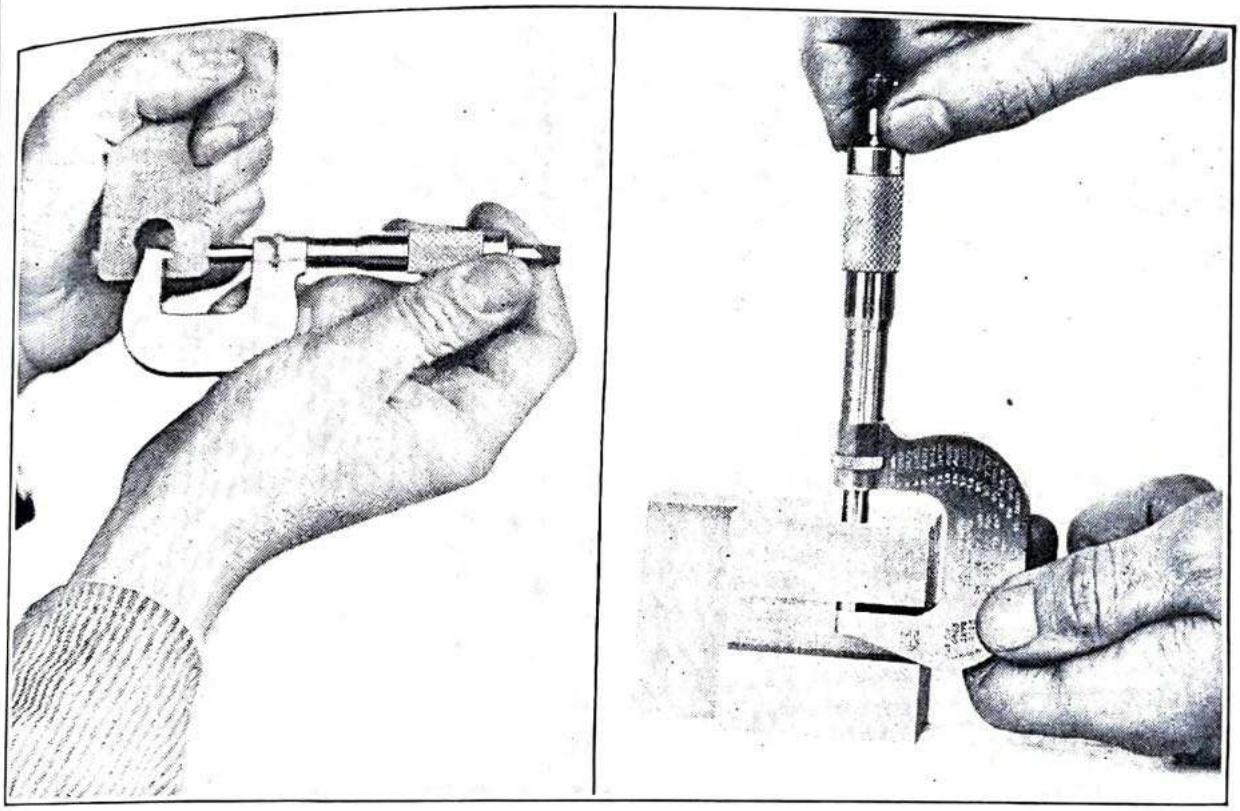


Has Clamp Ring and Ratchet Stop

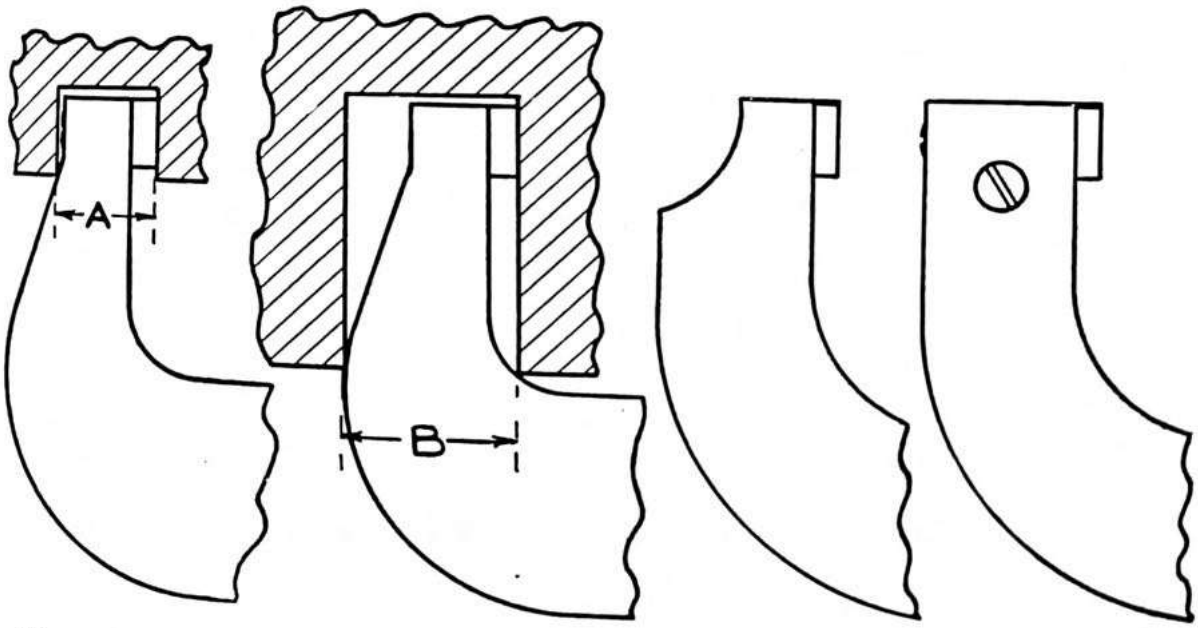
Can be used in places where anvil of usual style will not enter. See opposite page.

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.



Brown & Sharpe Narrow Frame Micrometer Calipers Nos. 12 and 13 will measure in places inaccessible to ordinary micrometers or micrometers with cutaway frames.



The frame at A is 11-32″ and can enter a slot of this width to a depth of 3-8″. The frame at B is 9-16″. Compare the utility of this type of frame with that of the cutaway or ordinary type, also shown, for measurements of this kind.

Micrometer Caliper No. 13

Patented

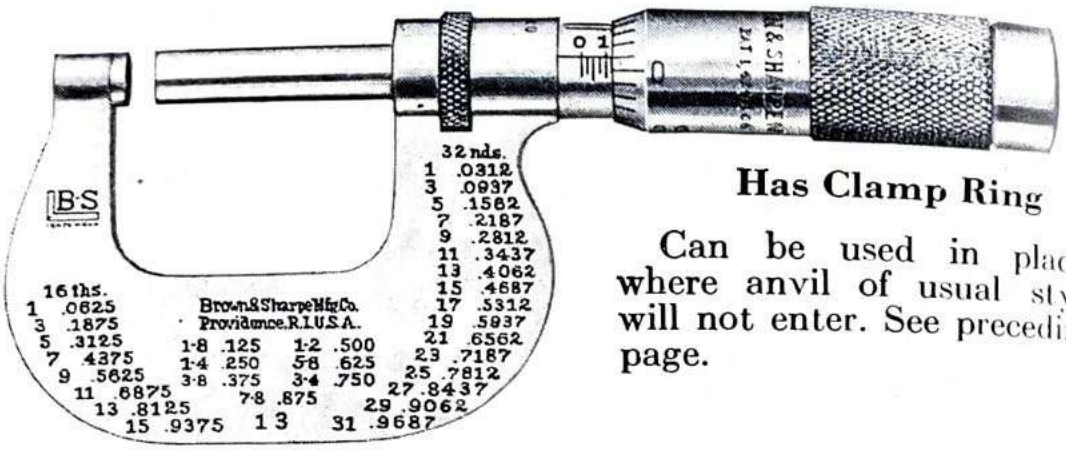
Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $11.25 Case, $1.25

13

13 RS



Has Clamp Ring

Can be used in places where anvil of usual style will not enter. See preceding page.

For reading Micrometer with ten-thousandths graduations, see page 230.

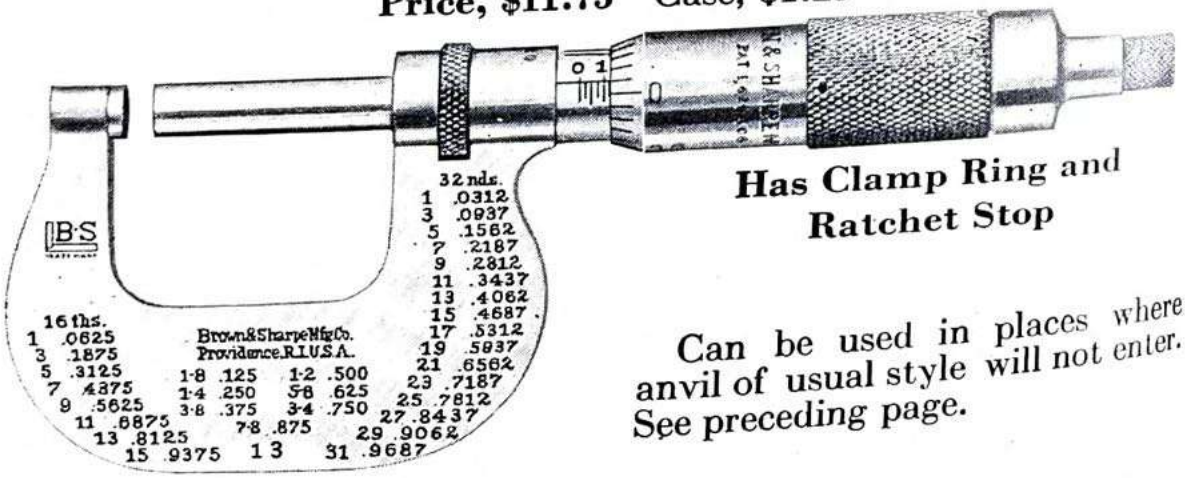
Micrometer Caliper No. 13RS

Patented

Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $11.75 Case, $1.25



Has Clamp Ring and Ratchet Stop

Can be used in places where anvil of usual style will not enter. See preceding page.

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box.

Micrometer Caliper No. 15

ENGLISH MEASURE or **METRIC MEASURE**

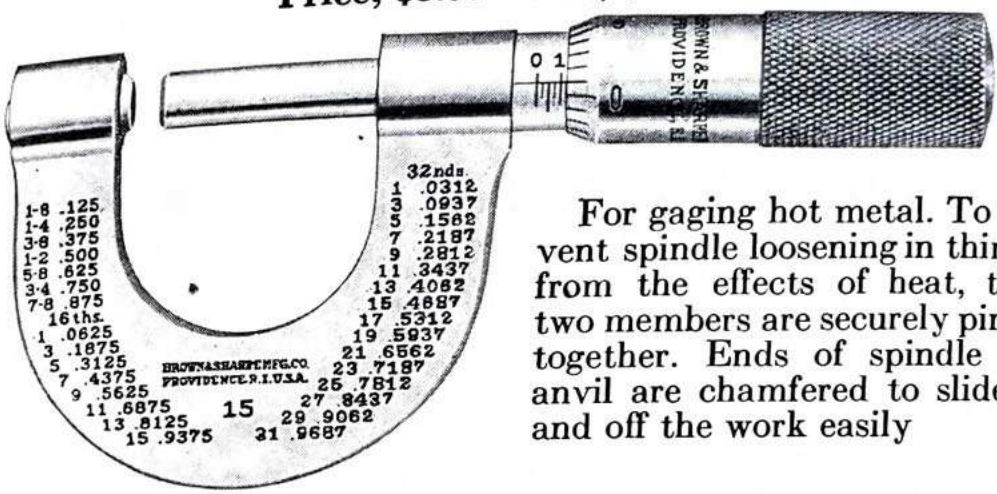
Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $8.50 Case, **$1.25**

15

15 RS



For gaging hot metal. To prevent spindle loosening in thimble from the effects of heat, these two members are securely pinned together. Ends of spindle and anvil are chamfered to slide on and off the work easily

Table of decimal equivalents omitted on Metric Micrometer.

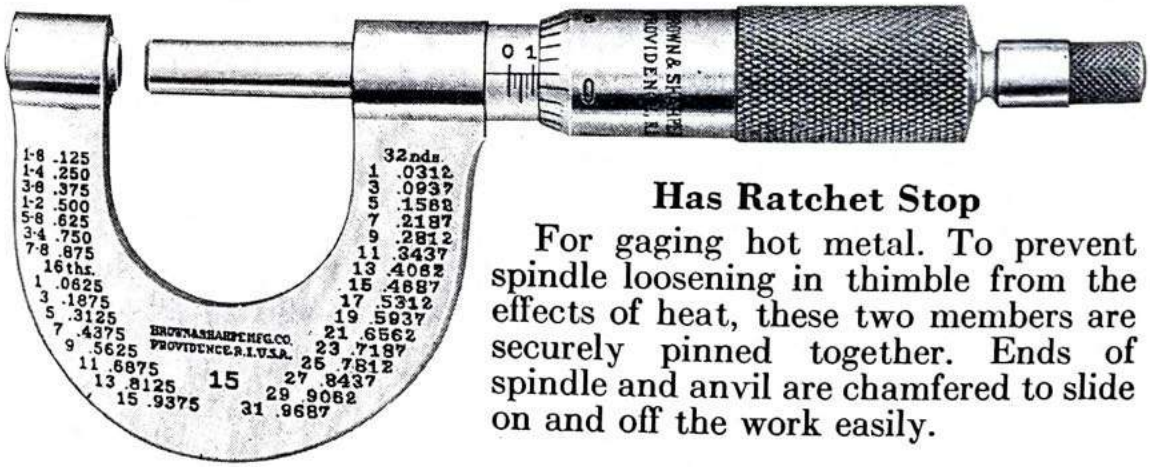
Micrometer Caliper No. 15RS

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $9.00 Case, **$1.25**



Has Ratchet Stop

For gaging hot metal. To prevent spindle loosening in thimble from the effects of heat, these two members are securely pinned together. Ends of spindle and anvil are chamfered to slide on and off the work easily.

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Caliper No. 17

ENGLISH MEASURE or **METRIC MEASURE**

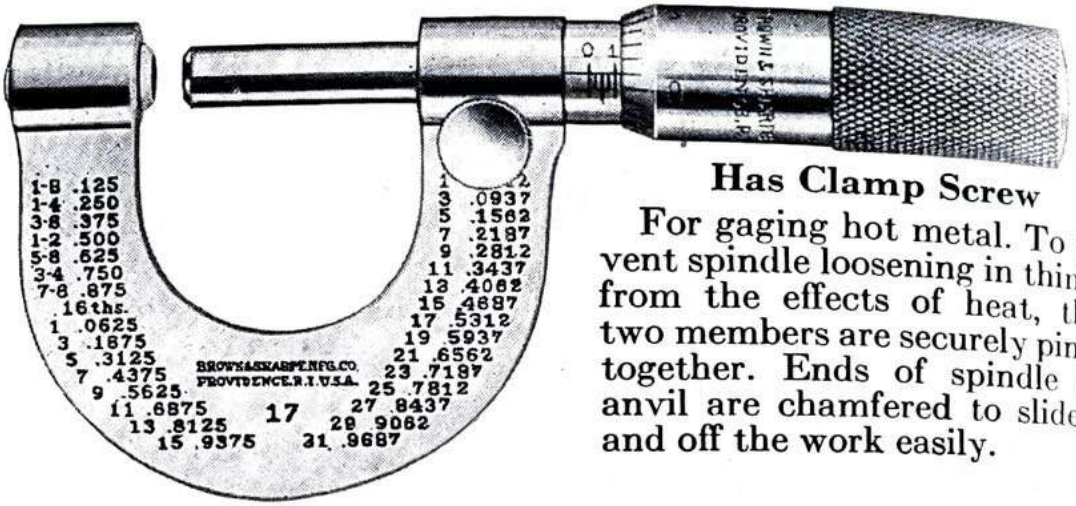
Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $9.50 Case, $1.25

17

17 RS



Has Clamp Screw

For gaging hot metal. To prevent spindle loosening in thimble from the effects of heat, these two members are securely pinned together. Ends of spindle and anvil are chamfered to slide on and off the work easily.

Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 17RS

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $10.00 Case, $1.25

Has Clamp Screw and Ratchet Stop

For gaging hot metal. To prevent spindle loosening in thimble from the effects of heat, these two members are securely pinned together. Ends of spindle and anvil are chamfered to slide on and off the work easily.

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Calipers Nos. 17 and 17RS

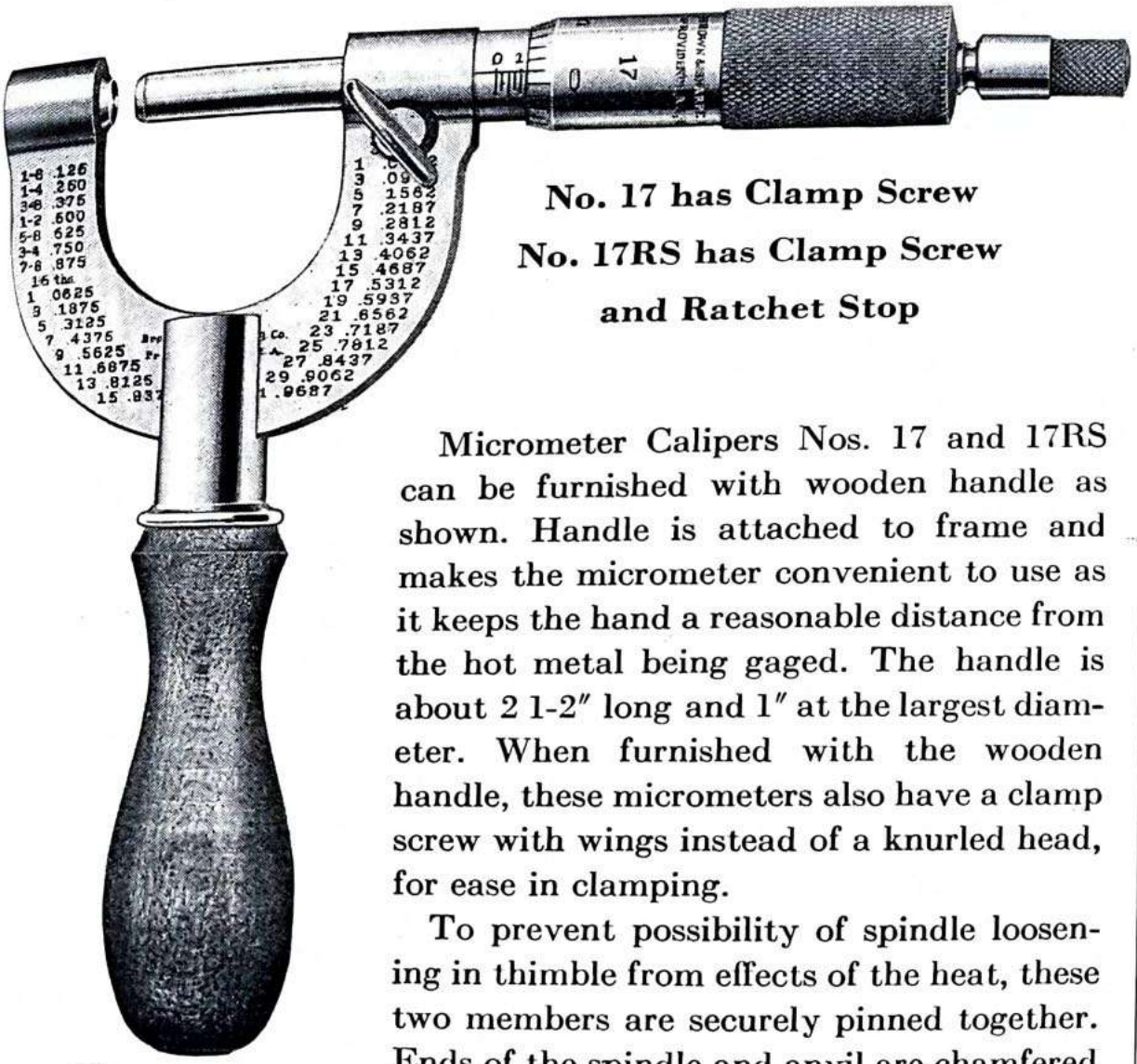
With Wooden Handle

No. 17, with Wooden Handle. Price, $12.00

No. 17 RS, with Wooden Handle. Price, $12.50

17

17 RS



No. 17 has Clamp Screw

No. 17RS has Clamp Screw and Ratchet Stop

Illustration shows tool with Ratchet Stop

Micrometer Calipers Nos. 17 and 17RS can be furnished with wooden handle as shown. Handle is attached to frame and makes the micrometer convenient to use as it keeps the hand a reasonable distance from the hot metal being gaged. The handle is about 2 1-2″ long and 1″ at the largest diameter. When furnished with the wooden handle, these micrometers also have a clamp screw with wings instead of a knurled head, for ease in clamping.

To prevent possibility of spindle loosening in thimble from effects of the heat, these two members are securely pinned together. Ends of the spindle and anvil are chamfered to slide on and off the work easily. Compensation for wear of measuring surfaces made by adjusting anvil.

Each of the above packed one in a box.

Micrometer Caliper No. 19

Patented

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $8.50 Case, **$1.25**

19

19 RS

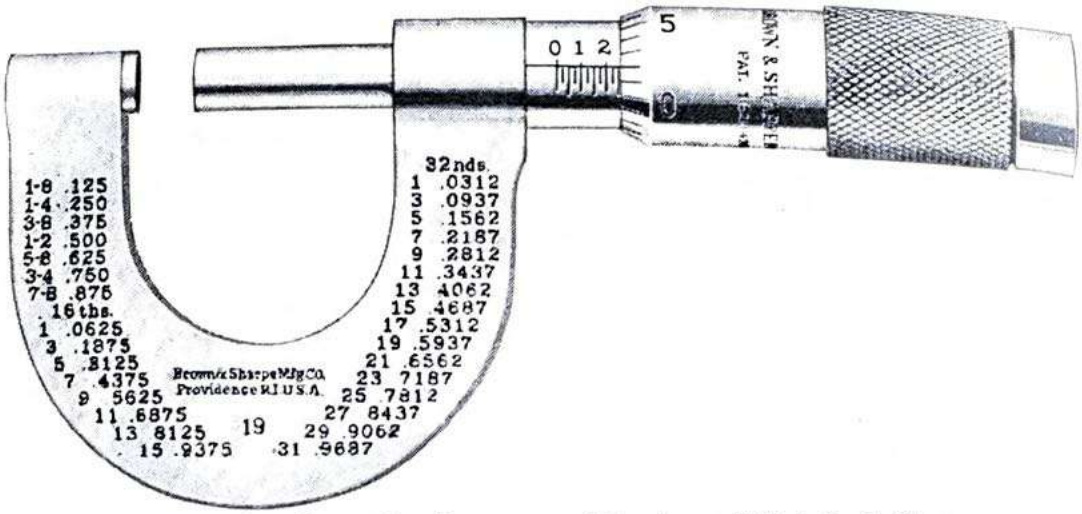


Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 19RS

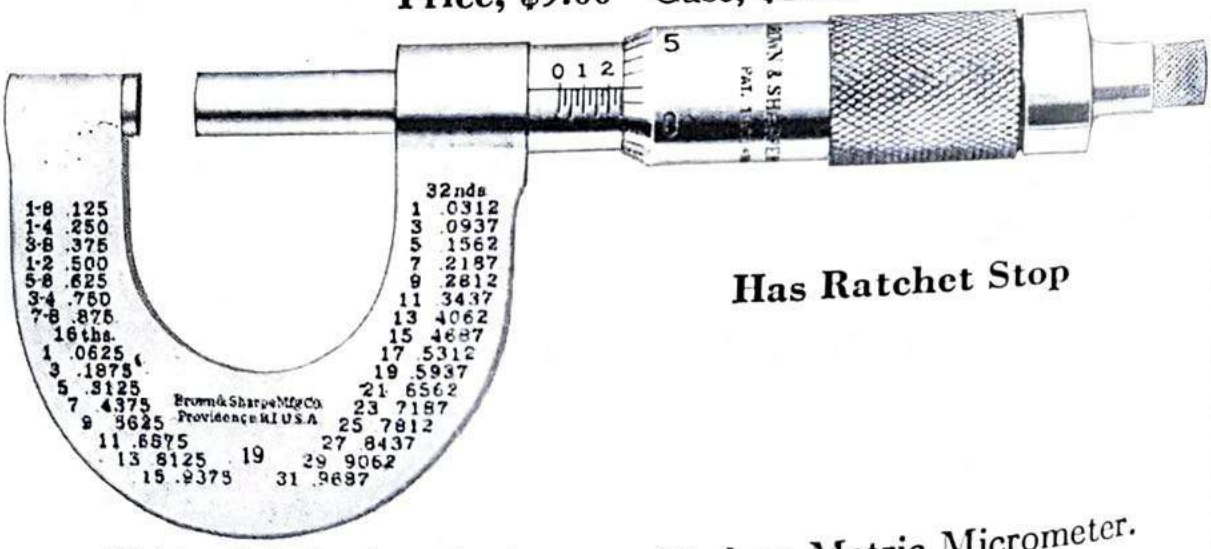
Patented

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $9.00 Case, **$1.25**



Has Ratchet Stop

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

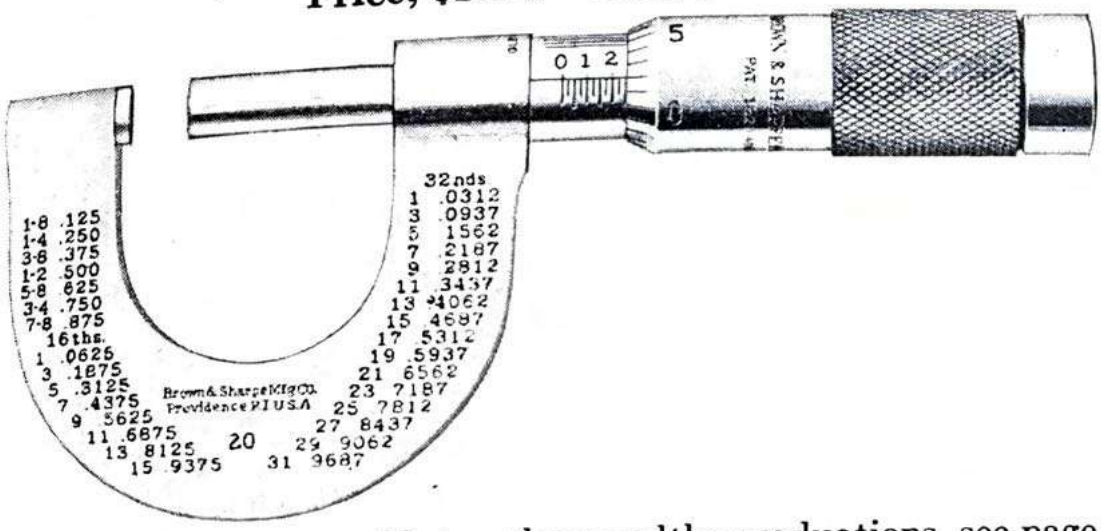
Micrometer Caliper No. 20

Patented

Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $10.25 Case, **$1.25**



20

20 RS

For reading Micrometer with ten-thousandths graduations, see page 230.

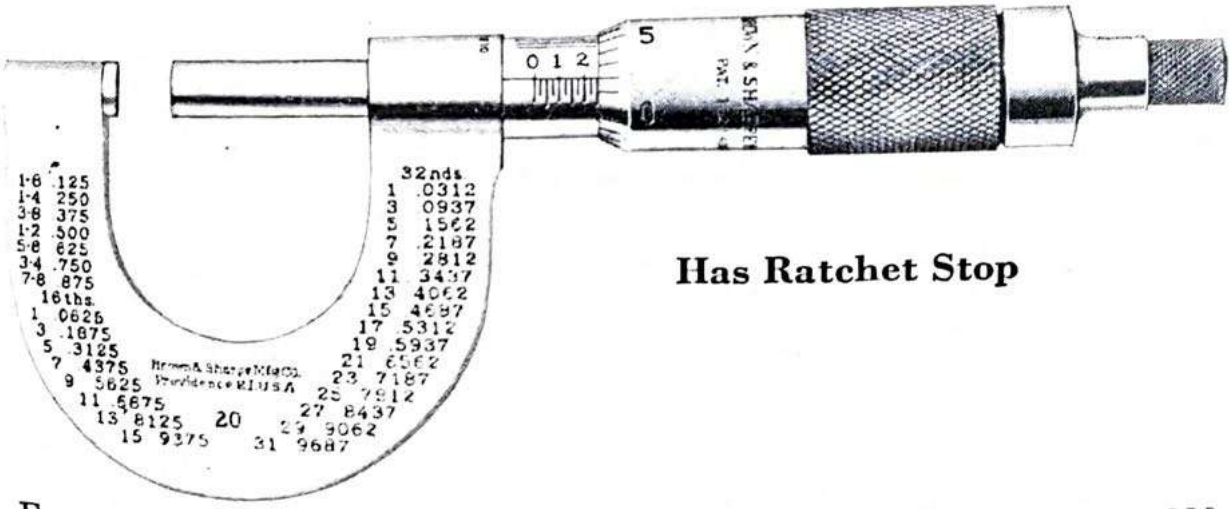
Micrometer Caliper No. 20RS

Patented

Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $10.75 Case, **$1.25**



Has Ratchet Stop

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box.

Micrometer Caliper No. 24

Patented

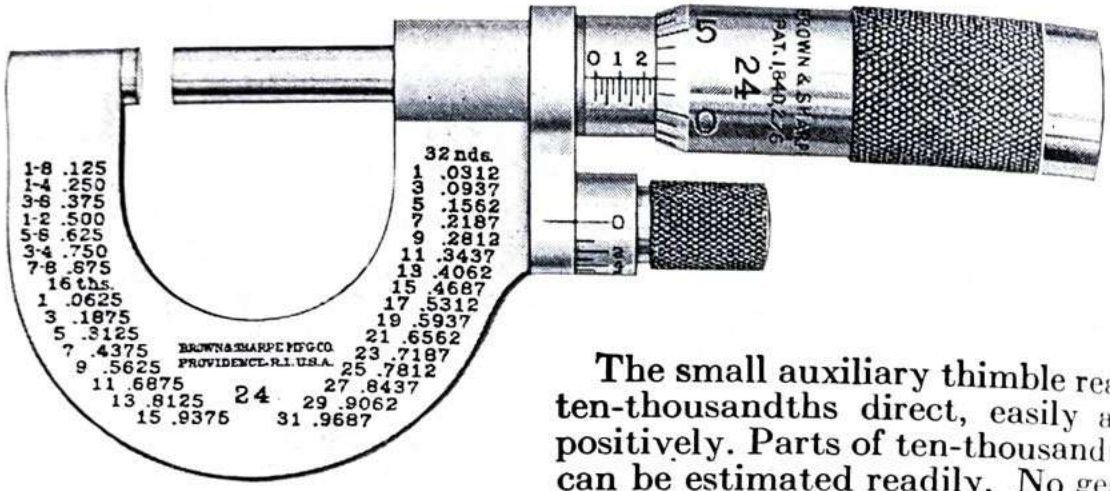
Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $17.50 Case, **$1.25**

24

24 RS



The small auxiliary thimble reads ten-thousandths direct, easily and positively. Parts of ten-thousandths can be estimated readily. No gears or intricate mechanisms to get out of order. See page opposite.

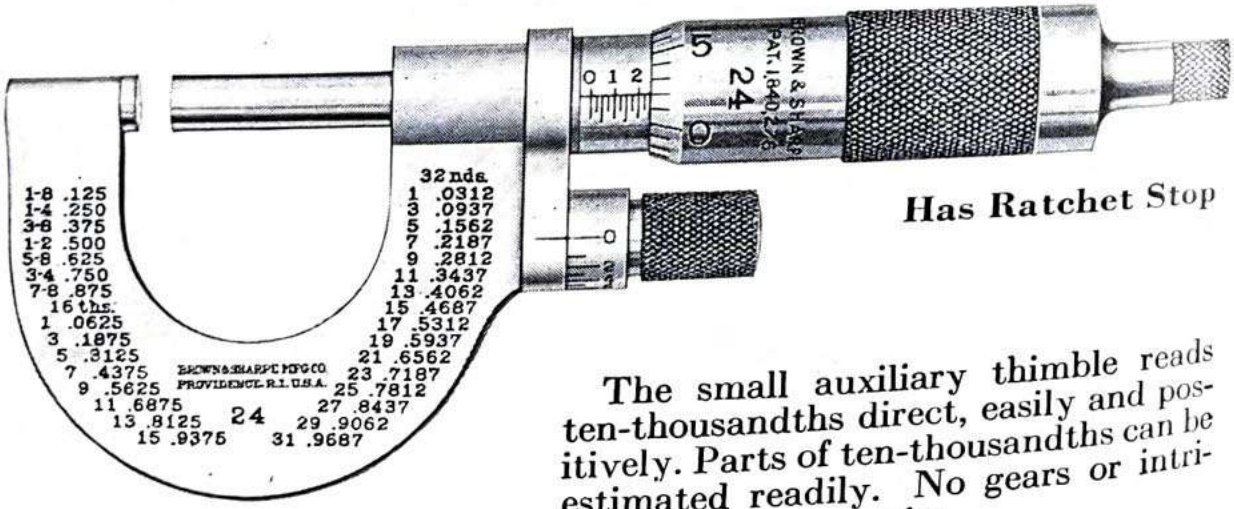
Micrometer Caliper No. 24RS

Patented

Range, 0 to 1″

by **ten-thousandths** as well as thousandths of an inch

Price, $18.00 Case, **$1.25**

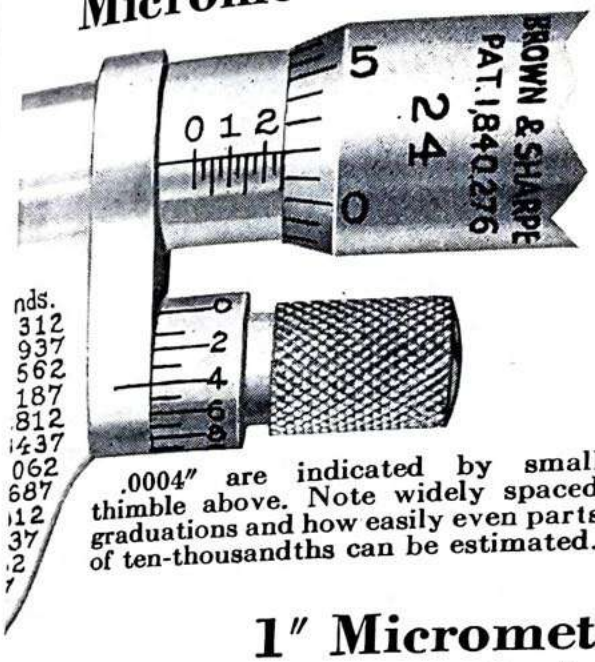


Has Ratchet Stop

The small auxiliary thimble reads ten-thousandths direct, easily and positively. Parts of ten-thousandths can be estimated readily. No gears or intricate mechanisms to get out of order. See page opposite.

Each of the above packed one in a box.

Reading Ten-Thousandths of an Inch with Micrometers having Auxiliary Thimble

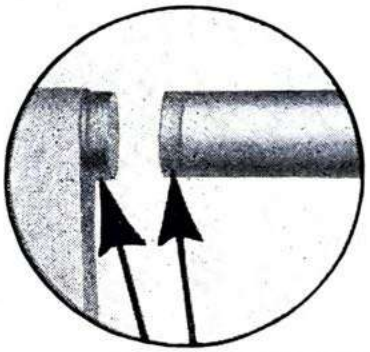


.0004″ are indicated by small thimble above. Note widely spaced graduations and how easily even parts of ten-thousandths can be estimated.

WITH Micrometer Calipers Nos. 24 and 24RS, and Bench Micrometer Caliper No. 240RS, thousandths of an inch are read in the conventional manner. The ten-thousandths can be determined by turning the small thimble, which turns independently of main thimble and spindle, until the line on the sleeve coincides with a line on the thimble. The ten-thousandths are then read direct from the small thimble.

1″ Micrometer Calipers with Tungsten Carbide Measuring Surfaces

THESE Micrometer Calipers have the ends of spindle and anvil faced with Tungsten Carbide, an extremely hard, almost wear-proof alloy. They are very desirable for use in places where the tool will be subjected to unusual wear as in twist drill manufacture, grinding rooms, etc., where abrasives or continued use over sharp edges destroys the accuracy of ordinary micrometers. These Micrometers are not carried in stock but can be furnished at short notice.



Micrometer Caliper No.		Price	Micrometer Caliper No.		Price	Micrometer Caliper No.		Price
8	With Tungsten Carbide Measuring Surfaces	$24.50	11	With Tungsten Carbide Measuring Surfaces	$21.25	13RS	With Tungsten Carbide Measuring Surfaces	$26.75
8RS		25.00	11RS		21.75	19		23.50
8S		27.75	11A		23.00	19RS		24.00
8SRS		28.25	11ARS		23.50	20		25.25
10		26.25	12		24.50	20RS		25.75
10RS		26.75	12RS		25.00	59		22.25
10S		29.50	13		26.25	59RS		22.75
10SRS		30.00						

Micrometer Caliper No. 233RS, measuring 0 to 1-2″ by ten-thousandths of an inch can also be furnished with Tungsten Carbide Measuring Surfaces. **Price, $45.00.**

Micrometer Calipers, in other sizes, can be furnished to order with Tungsten Carbide Measuring Surfaces. Prices upon application.

Each of the above packed one in a box.

Micrometer Caliper No. 38

Patented

ENGLISH MEASURE or **METRIC MEASURE**

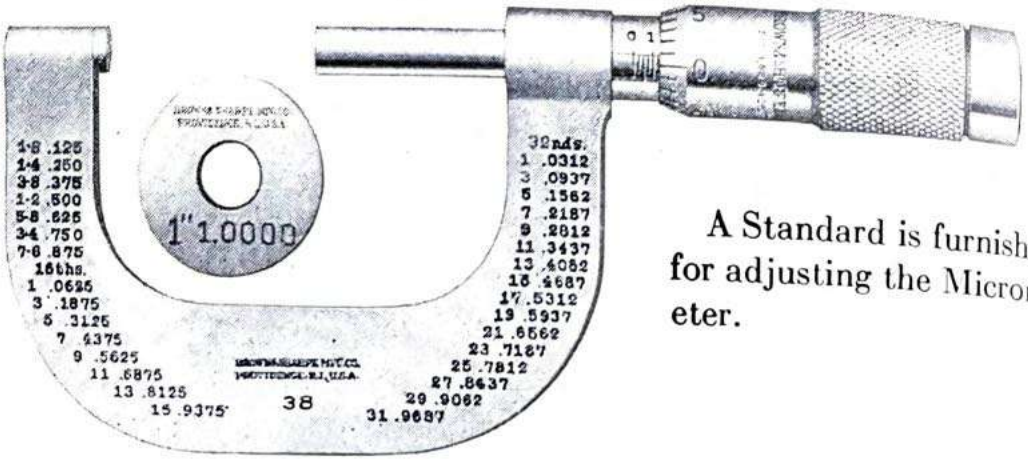
Range, 1″ to 2″ — by thousandths of an inch

Range, 25 mm to 50 mm — by hundredths of a millimeter

38

Price, $9.50 Case, **$1.60**

38 RS



A Standard is furnished for adjusting the Micrometer.

Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 38RS

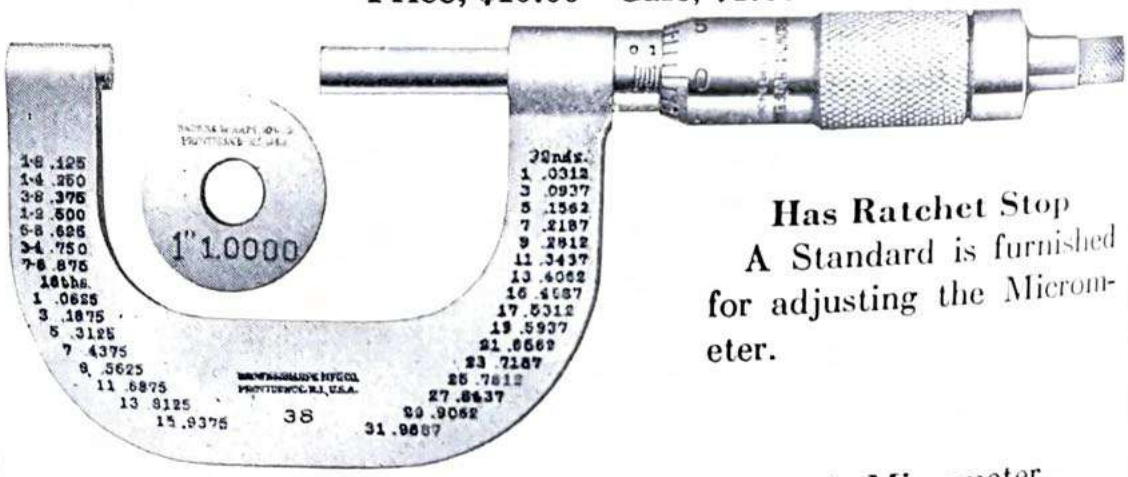
Patented

ENGLISH MEASURE or **METRIC MEASURE**

Range, 1″ to 2″ — by thousandths of an inch

Range, 25 mm to 50 mm — by hundredths of a millimeter

Price, $10.00 Case, **$1.60**



Has Ratchet Stop

A Standard is furnished for adjusting the Micrometer.

Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Caliper No. 45

Patented

ENGLISH MEASURE
Range, 0 to 2″
by thousandths of an inch

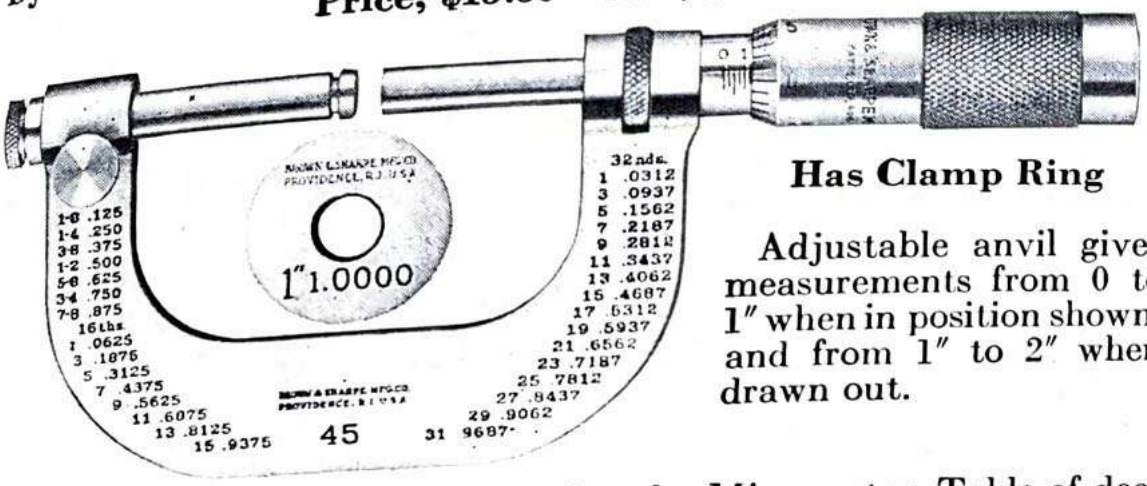
or

METRIC MEASURE
Range, 0 to 50 mm
by hundredths of a millimeter

Price, $13.50 Case, **$1.60**

45

45 RS



Has Clamp Ring

Adjustable anvil gives measurements from 0 to 1″ when in position shown, and from 1″ to 2″ when drawn out.

A Standard is furnished for adjusting the Micrometer. Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 45RS

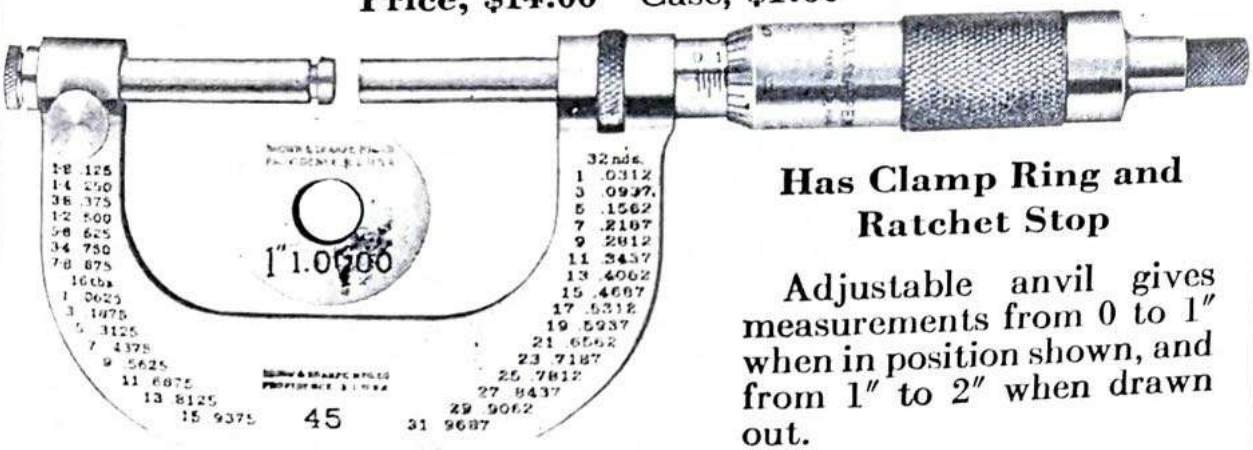
Patented

ENGLISH MEASURE
Range, 0 to 2″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 50 mm
by hundredths of a millimeter

Price, $14.00 Case, **$1.60**



Has Clamp Ring and Ratchet Stop

Adjustable anvil gives measurements from 0 to 1″ when in position shown, and from 1″ to 2″ when drawn out.

A Standard is furnished for adjusting the Micrometer. Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Caliper No. 47

Patented

ENGLISH MEASURE
Range, 1″ to 2″
by thousandths of an inch

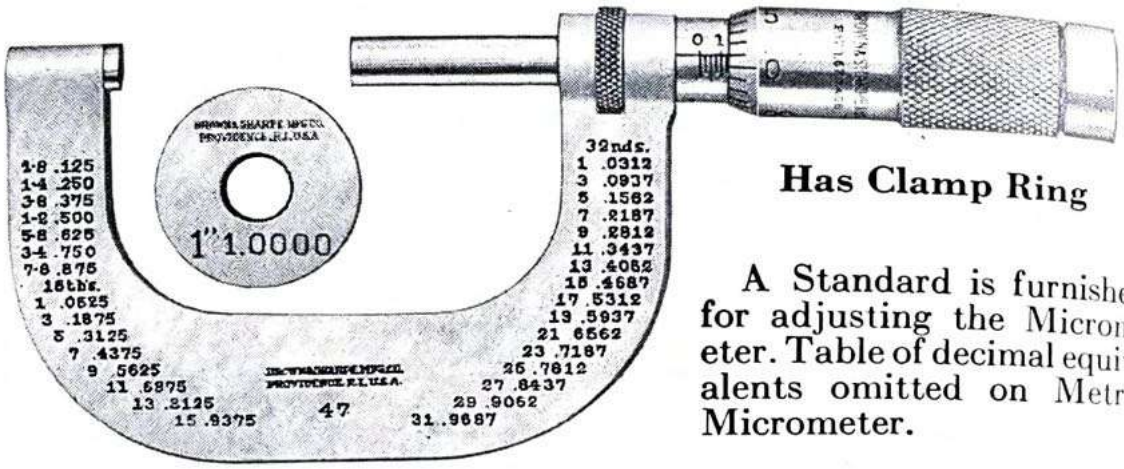
or

METRIC MEASURE
Range, 25 mm to 50 mm
by hundredths of a millimeter

Price, $10.50 Case, **$1.60**

47

47 RS



Has Clamp Ring

A Standard is furnished for adjusting the Micrometer. Table of decimal equivalents omitted on Metric Micrometer.

Micrometer Caliper No. 47RS

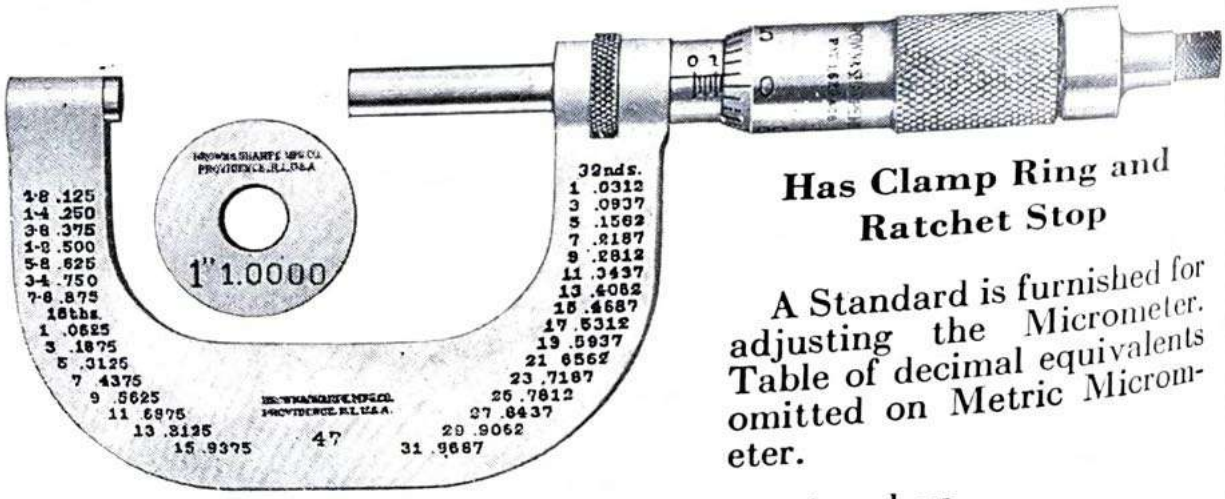
Patented

ENGLISH MEASURE
Range, 1″ to 2″
by thousandths of an inch

or

METRIC MEASURE
Range, 25 mm to 50 mm
by hundredths of a millimeter

Price, $11.00 Case, **$1.60**



Has Clamp Ring and Ratchet Stop

A Standard is furnished for adjusting the Micrometer. Table of decimal equivalents omitted on Metric Micrometer.

Each of the above packed one in a box.

Micrometer Caliper No. 48

Patented

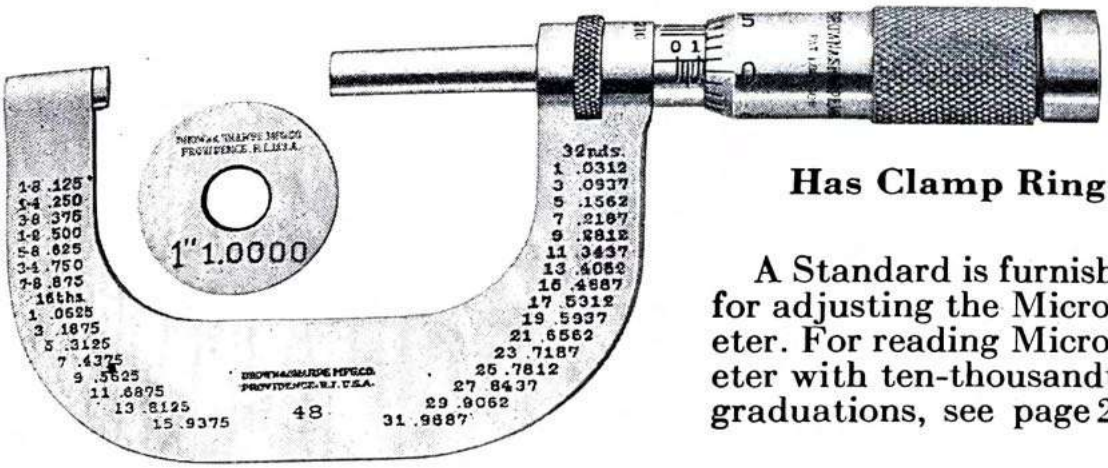
Range, 1″ to 2″

by **ten-thousandths** as well as thousandths of an inch.

Price, $12.25 Case, **$1.60**

48

48 RS



Has Clamp Ring

A Standard is furnished for adjusting the Micrometer. For reading Micrometer with ten-thousandths graduations, see page 230.

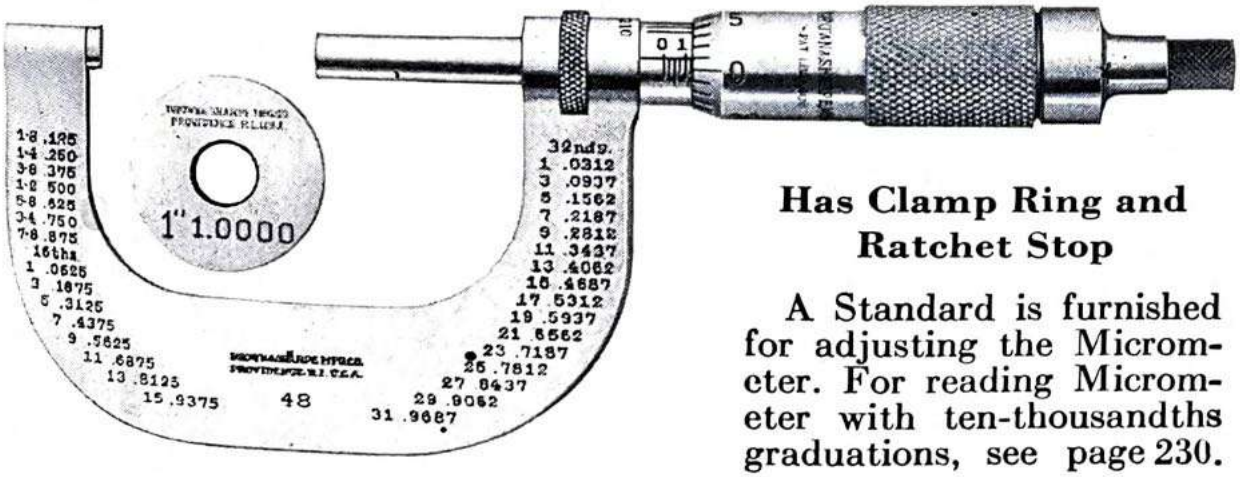
Micrometer Caliper No. 48RS

Patented

Range, 1″ to 2″

by **ten-thousandths** as well as thousandths of an inch.

Price, $12.75 Case, **$1.60**

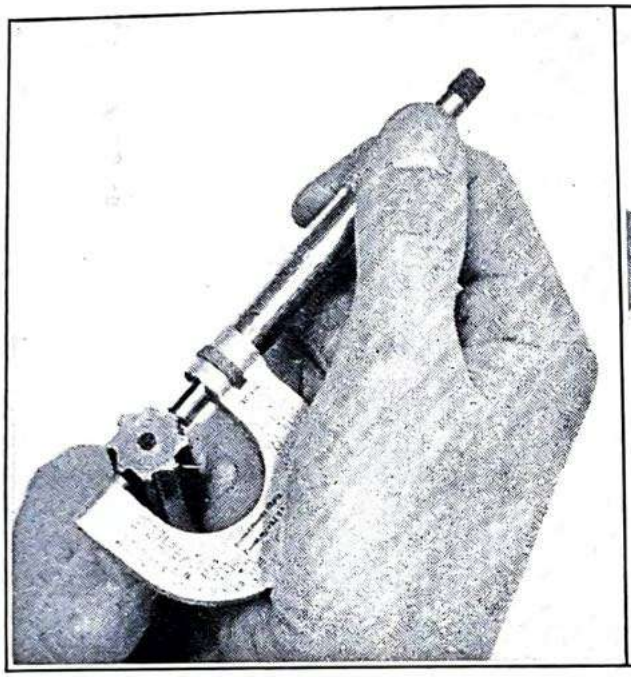


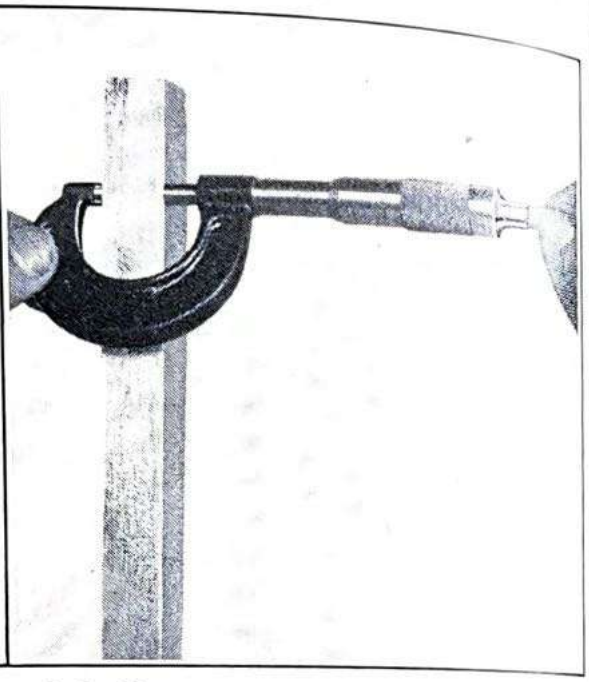
Has Clamp Ring and Ratchet Stop

A Standard is furnished for adjusting the Micrometer. For reading Micrometer with ten-thousandths graduations, see page 230.

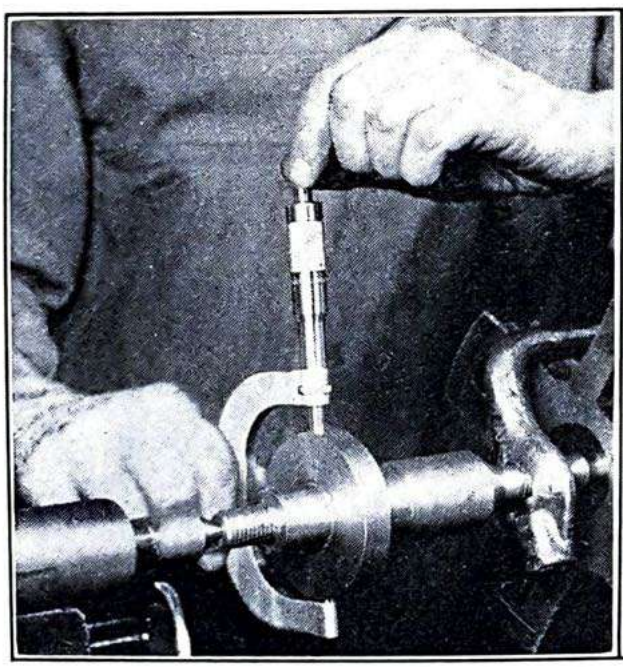
Each of the above packed one in a box.

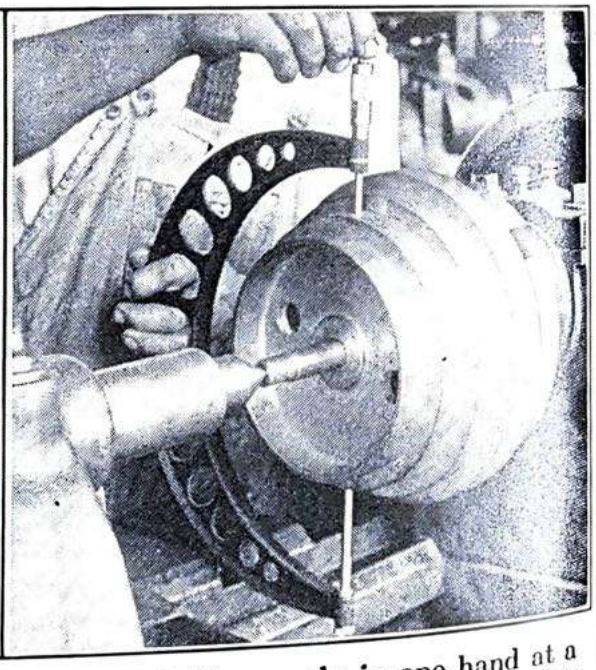
Suggestions for Holding a Micrometer Caliper





In using a one inch Micrometer for small work, hold the tool in one hand, turning the thimble with the same hand, as shown. This permits freedom of the other hand for holding the work. In measuring larger or stationary work, the frame should be held securely in one hand while the other hand turns the thimble.





In using a larger micrometer, the frame should be held securely in one hand at a point where its weight is supported most conveniently without cramping the measuring surfaces. The other hand should turn the thimble.

Micrometer Caliper No. 50

Patented

ENGLISH MEASURE
Range, 2″ to 3″
by thousandths of an inch

or

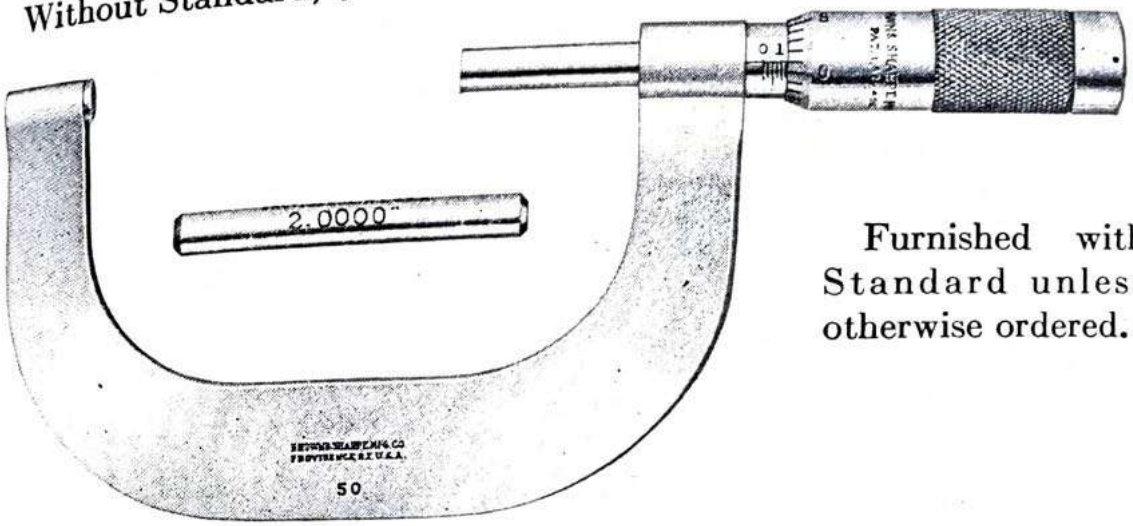
METRIC MEASURE
Range, 50 mm to 75 mm
by hundredths of a millimeter

Price

Without Standard, **$11.50**; With Standard, **$12.75**; Case, **$3.00**

50

50 RS



Furnished with Standard unless otherwise ordered.

Micrometer Caliper No. 50RS

Patented

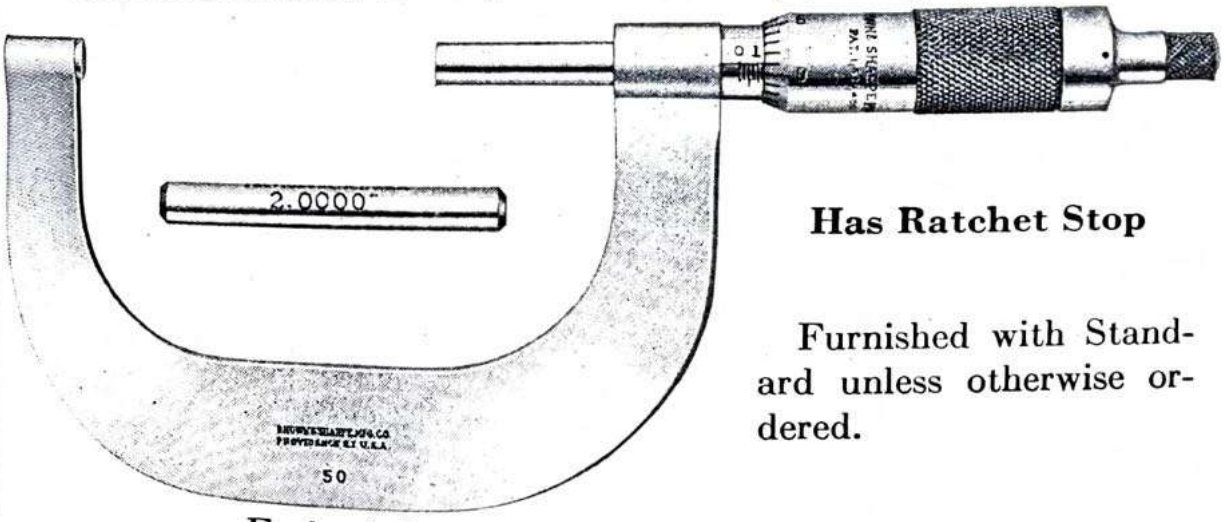
ENGLISH MEASURE
Range, 2″ to 3″
by thousandths of an inch

or

METRIC MEASURE
Range, 50 mm to 75 mm
by hundredths of a millimeter

Price

Without Standard, **$12.00**; With Standard, **$13.25**; Case, **$3.00**



Has Ratchet Stop

Furnished with Standard unless otherwise ordered.

Each of the above packed one in a box.

Micrometer Caliper No. 52

Patented

ENGLISH MEASURE
Range, 2″ to 3″
by thousandths of an inch

or

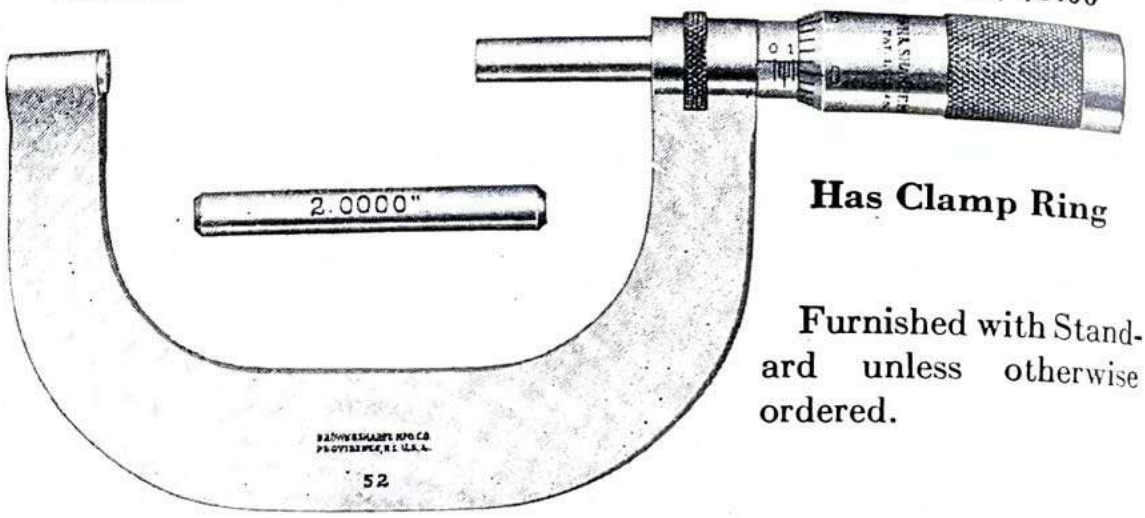
METRIC MEASURE
Range, 50 mm to 75 mm
by hundredths of a millimeter

Price

Without Standard, **$12.50**; With Standard, **$13.75**; Case, **$3.00**

52

52 RS



Has Clamp Ring

Furnished with Standard unless otherwise ordered.

Micrometer Caliper No. 52RS

Patented

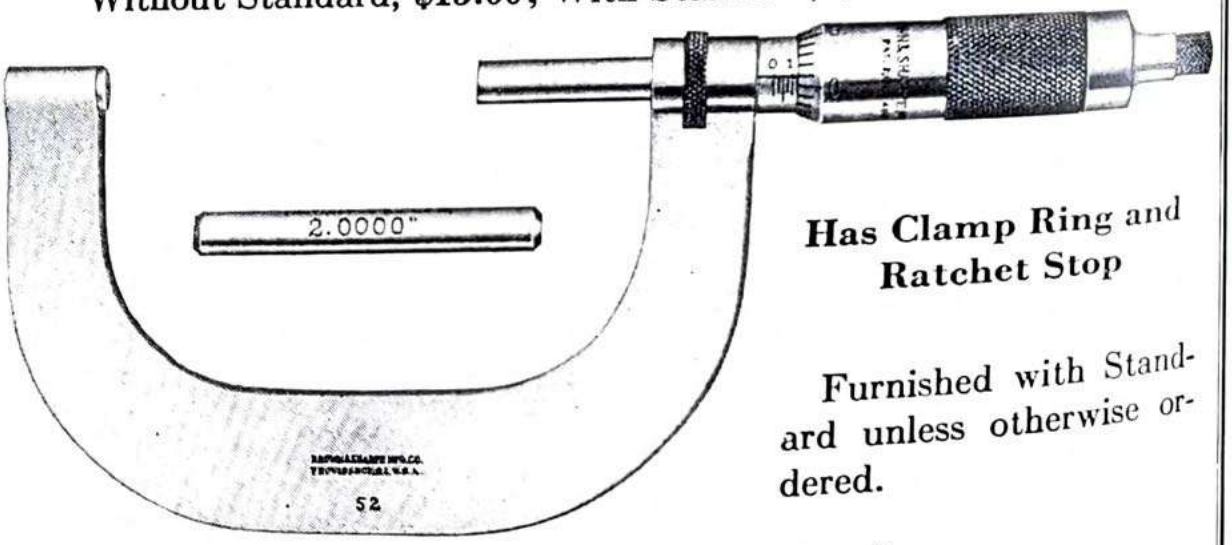
ENGLISH MEASURE
Range, 2″ to 3″
by thousandths of an inch

or

METRIC MEASURE
Range, 50 mm to 75 mm
by hundredths of a millimeter

Price

Without Standard, **$13.00**; With Standard, **$14.25**; Case, **$3.00**



Has Clamp Ring and Ratchet Stop

Furnished with Standard unless otherwise ordered.

Each of the above packed one in a box.

Micrometer Caliper No. 53

Patented

Range, 2″ to 3″

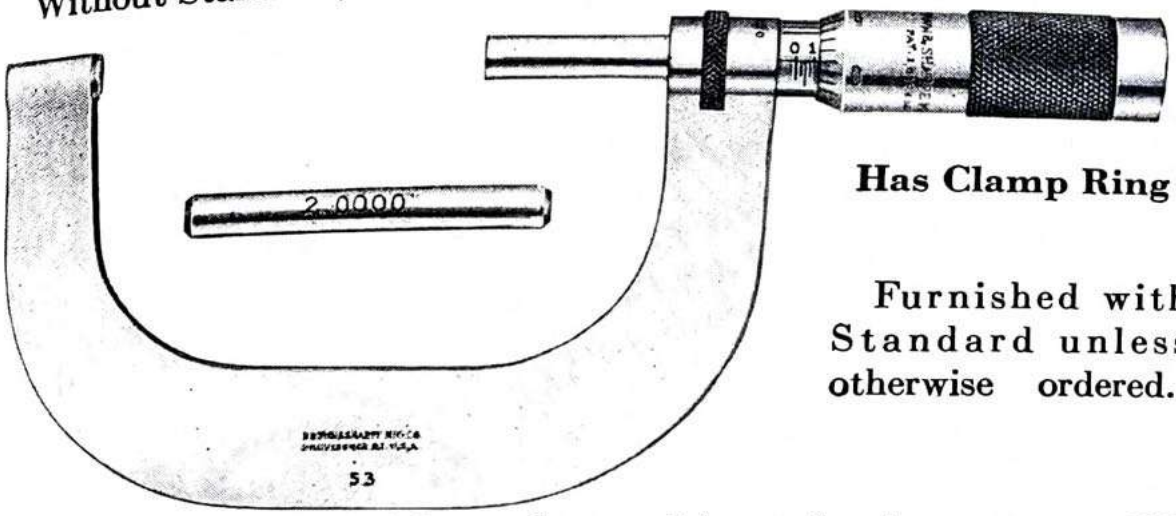
by **ten-thousandths** as well as thousandths of an inch

Price

Without Standard, **$14.25**; With Standard, **$15.50**; Case, **$3.00**

53

53 RS



Has Clamp Ring

Furnished with Standard unless otherwise ordered.

For reading Micrometer with ten-thousandths graduations, see page 230.

Micrometer Caliper No. 53RS

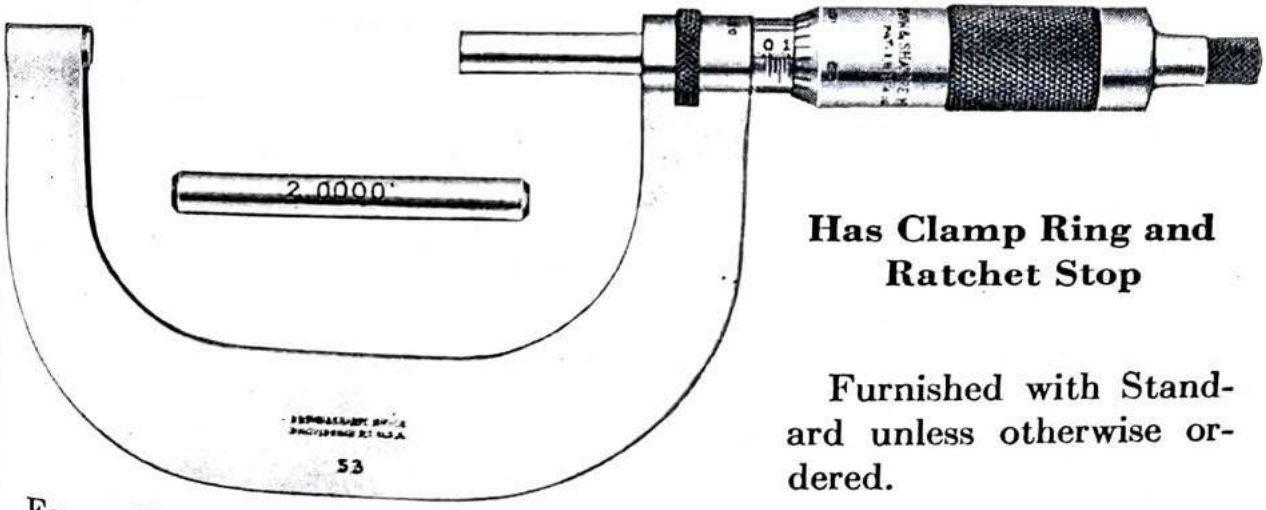
Patented

Range, 2″ to 3″

by **ten-thousandths** as well as thousandths of an inch

Price

Without Standard, **$14.75**; With Standard, **$16.00**; Case, **$3.00**



Has Clamp Ring and Ratchet Stop

Furnished with Standard unless otherwise ordered.

For reading Micrometer with ten-thousandths graduations, see page 230.

Each of the above packed one in a box.

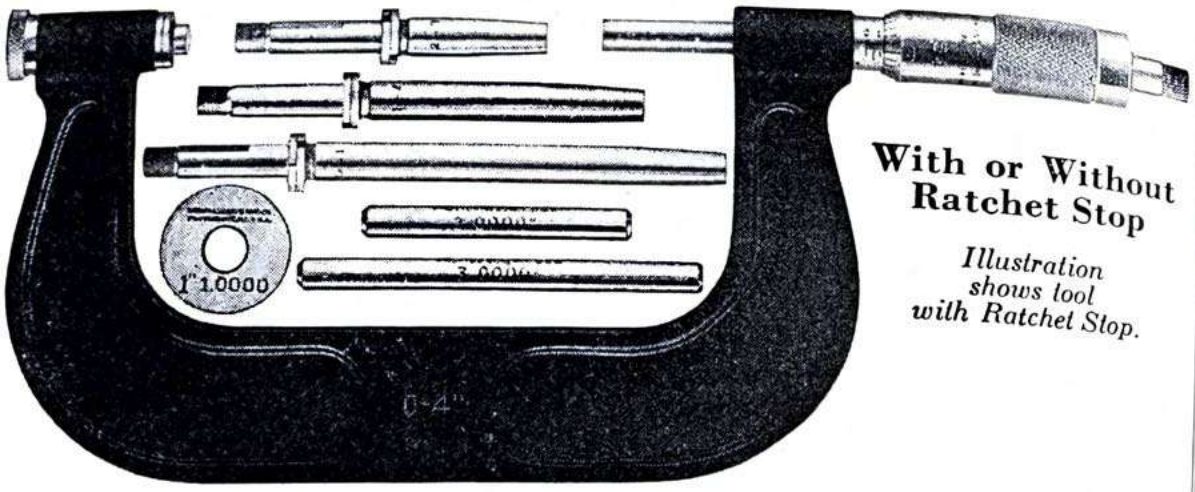
Micrometer Calipers Nos. 54 and 54RS

Patented

Range, 0 to 4″, by thousandths of an inch

54

54 RS



With or Without Ratchet Stop

Illustration shows tool with Ratchet Stop.

Price	**No. 54**	Without Standards,	**$18.00**
		With Standards,	**21.75**
	No. 54RS (Has Ratchet Stop)	Without Standards,	**18.50**
		With Standards,	**22.25**

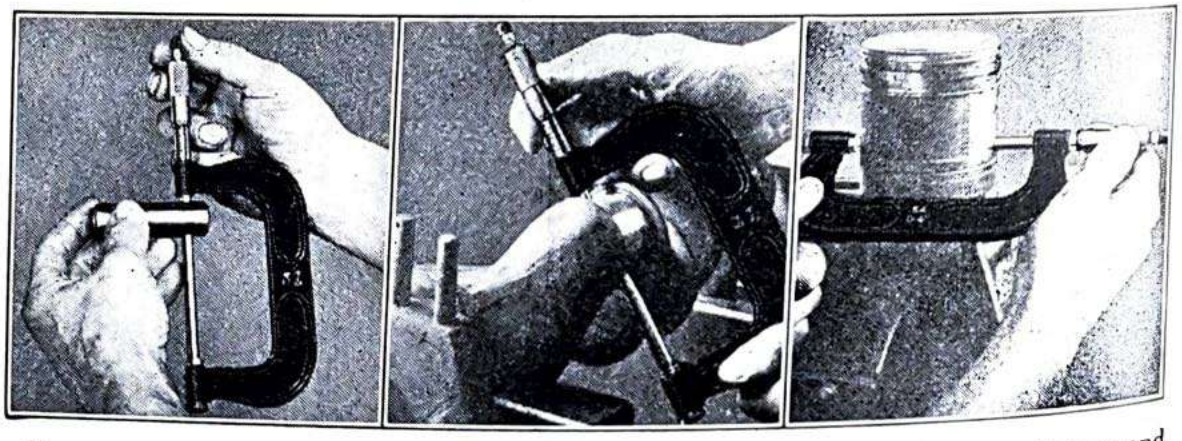
Price includes a finished wooden case.

A set of three Standards furnished unless otherwise ordered.

Particularly adapted for the shop that does not wish to invest in set of four micrometers. Well suited for automotive shops as it measures accurately most parts that require close fitting.

Range of measurement is obtained by interchangeable anvils of different lengths. Each anvil has separate means of adjustment for wear.

Packed one in a box.



No. 54 accurately determines the size or wear of wrist pins, bearings, pistons and other automotive parts.

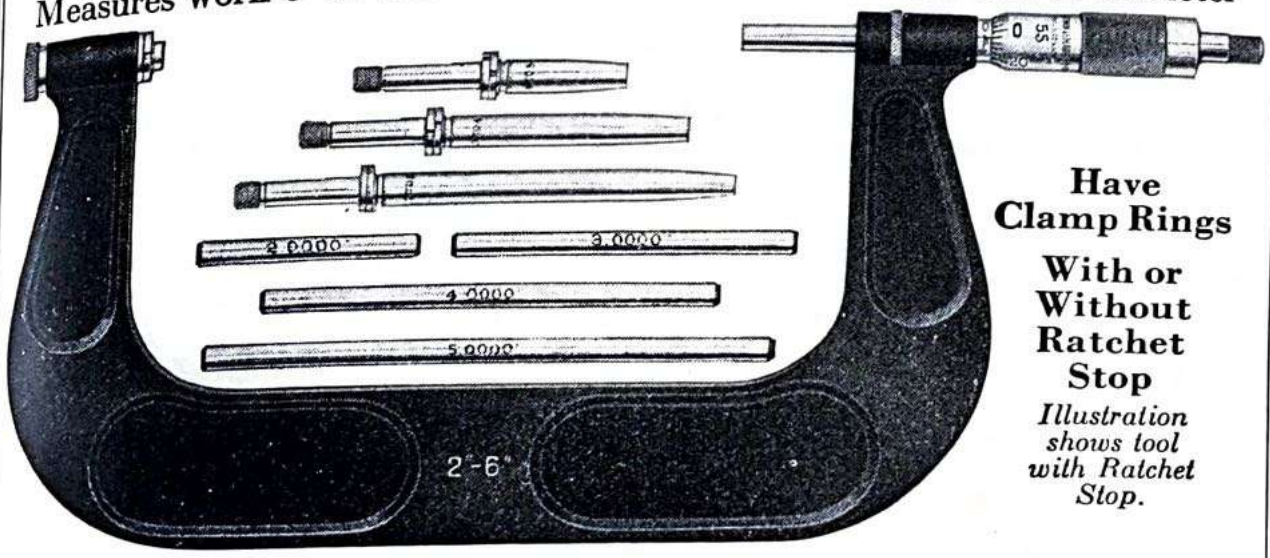
Micrometer Calipers Nos. 55 and 55RS

Patented

ENGLISH MEASURE
Range, 2″ to 6″
by thousandths of an inch
Measures work 6″ in diameter

or

METRIC MEASURE
Range, 50 mm to 150 mm
by hundredths of a millimeter
Measures work 150 mm in diameter



55

55 RS

Have Clamp Rings

With or Without Ratchet Stop

Illustration shows tool with Ratchet Stop.

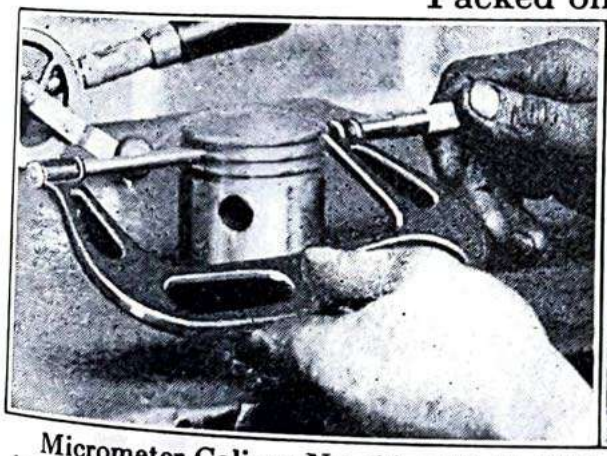
Price	**No. 55**	Without Standards,	**$20.00**
		With Standards,	**26.50**
	No. 55RS (Has Ratchet Stop)	Without Standards,	**20.50**
		With Standards,	**27.00**

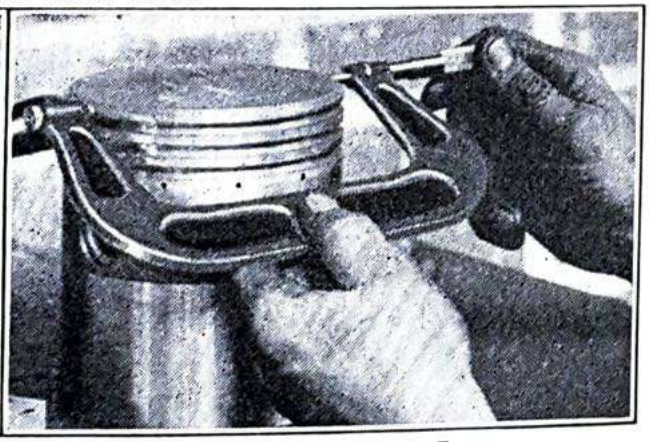
Price includes a finished wooden case.
A set of four Standards is furnished unless otherwise ordered.

Particularly adapted for shop that does not wish to invest in set of four micrometers. Well suited for automotive shops for measuring pistons.

Range of measurement is obtained by interchangeable anvils of different lengths. Each anvil has separate means of adjustment for wear.

Packed one in a box.





Micrometer Caliper No. 55, with its 2″ to 6″ range, is extremely useful. In motor service work it measures all pistons ordinarily used.

Micrometer Calipers Nos. 57 and 57RS

Patented

ENGLISH MEASURE
Range, 6″ to 12″
by thousandths of an inch
Measures work 12″ in diameter

or

METRIC MEASURE
Range, 150 mm to 300 mm
by hundredths of a millimeter
Measures work 300 mm in diameter

57

57 RS

Particularly adapted for the shop that requires accurate measurements from 6″ to 12″ but which does not have sufficient demand to warrant investment in a more expensive set of six separate micrometers.

Range of measurement is obtained by interchangeable anvils of different lengths. Each anvil has separate means of adjustment for wear.

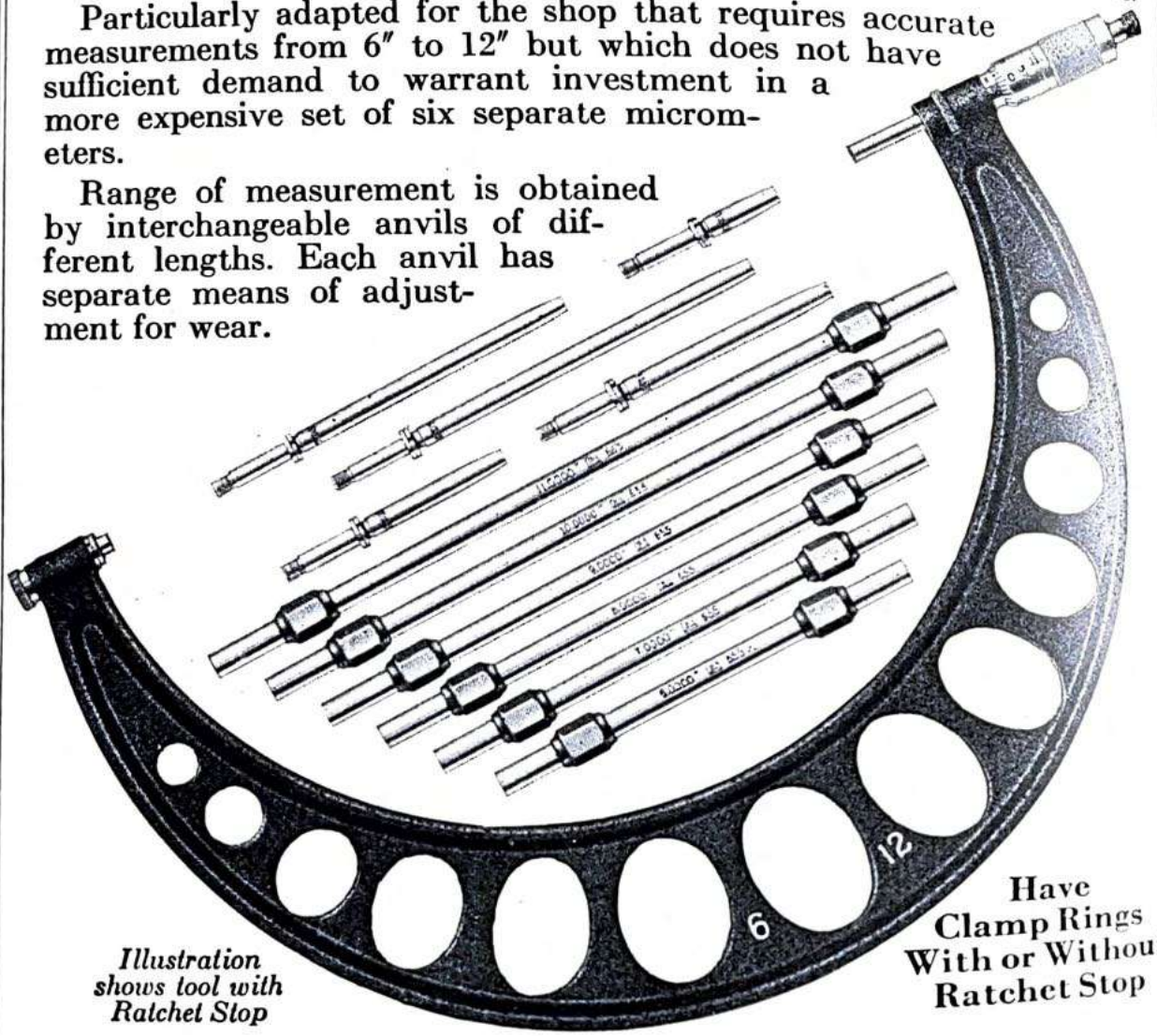


Illustration shows tool with Ratchet Stop

Have Clamp Rings With or Without Ratchet Stop

Price	**No. 57**	Without Standards,	$37.50
		With Standards,	54.75
	No. 57RS, (Has Ratchet Stop)	Without Standards,	38.00
		With Standards,	55.25

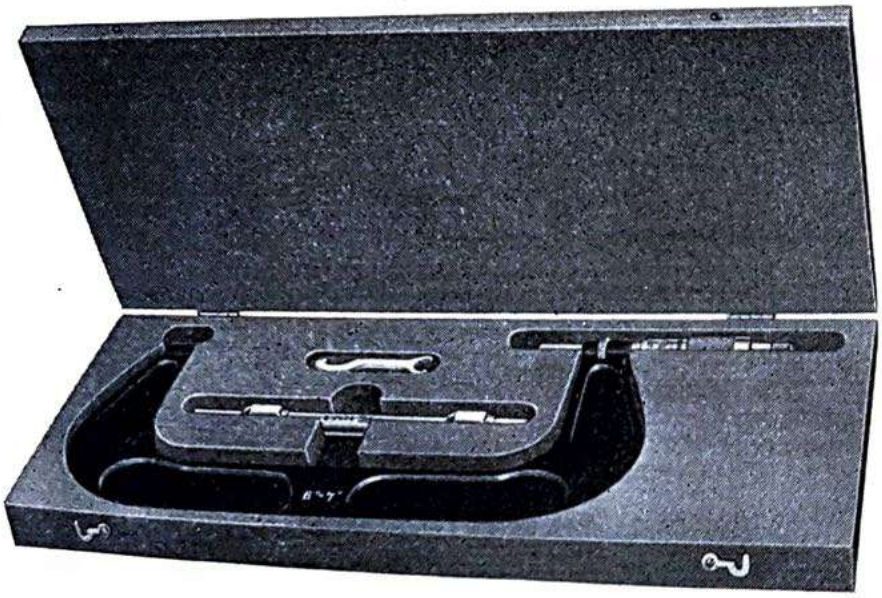
Price includes a finished wooden case.
A set of six Standards is furnished unless otherwise ordered.
Packed one in a box.

Micrometer Calipers Nos. 59 to 76 and 59RS to 76RS

THE Micrometer Calipers, shown on following pages, have enameled I-section frames to give the greatest rigidity and strength with lightness.

Micrometer Calipers Nos. 59 to 76 and 59RS to 76RS have the advantages of other Brown & Sharpe Micrometers including wear resisting anvil and spindle, easy reading graduations and figures, and patented adjustable thimble. With the exception of Nos. 60 and 62 and 60RS and 62RS, they are regularly furnished with a Clamp Ring which clamps the spindle and preserves the setting. (For 1″ Micrometers without Clamp Ring see Nos. 11 and 11A on pages 240 and 241.)

The above Micrometer Calipers are furnished in sets in various combinations as shown on pages 270, 271, 273 and 274.



Micrometer Calipers, sizes 71 to 76, are furnished in nicely finished wooden cases which will be found convenient for shop use and well adapted to protect the tools.

Micrometer Calipers Nos. 59 to 76 and 59RS to 76RS

No. 59

For this size without Clamp Ring see Nos. 11 and 11A on pages 240 and 241.

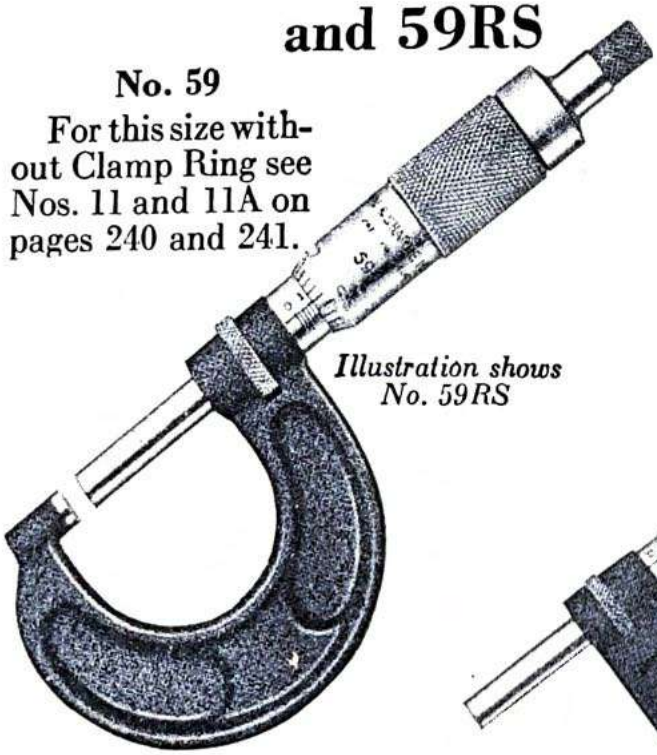
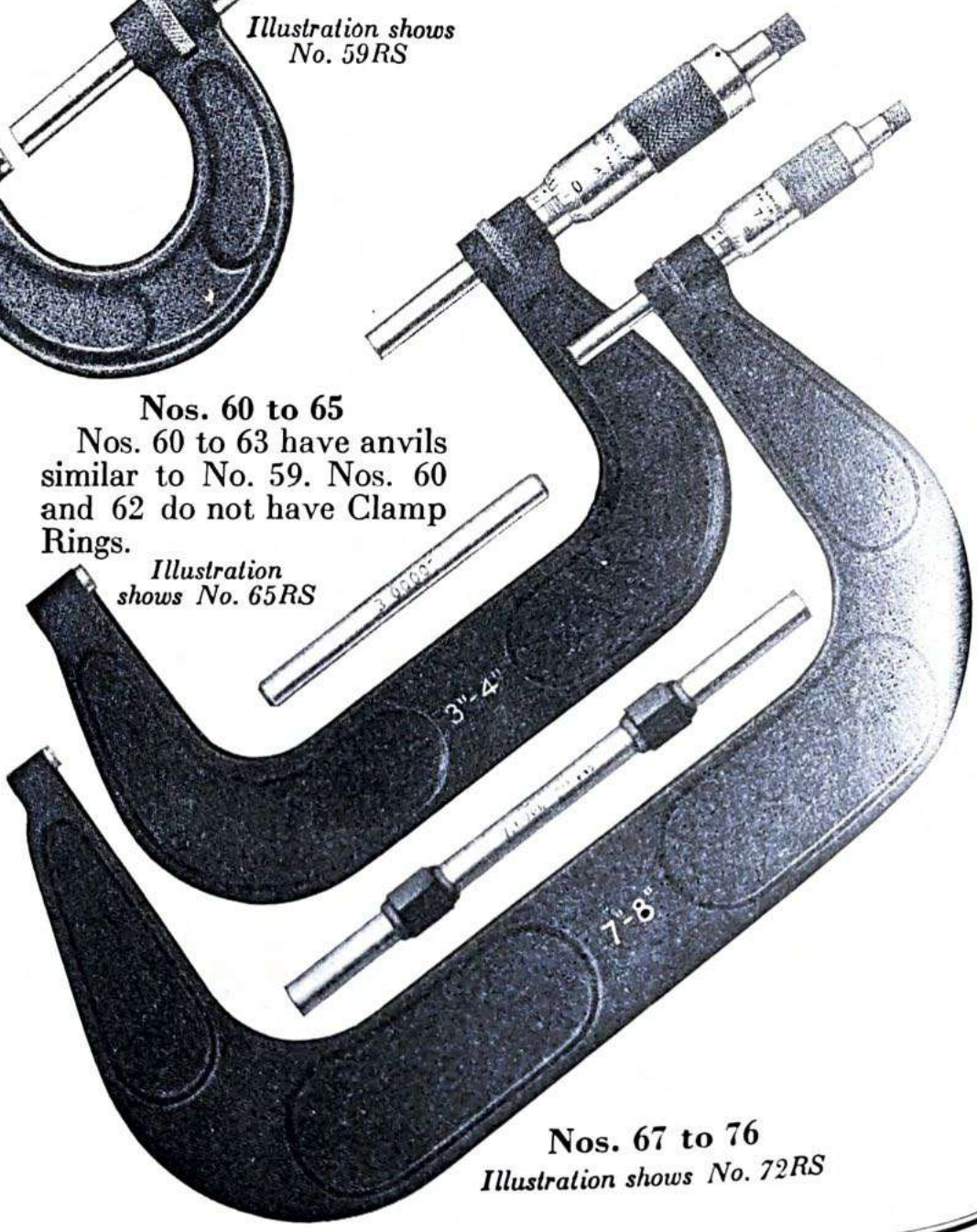


Illustration shows No. 59RS

Nos. 60 to 65

Nos. 60 to 63 have anvils similar to No. 59. Nos. 60 and 62 do not have Clamp Rings.

Illustration shows No. 65RS



Nos. 67 to 76

Illustration shows No. 72RS

Micrometer Calipers Nos. 59 to 76 and 59RS to 76RS

Have Clamp Rings — ***Patented***

ENGLISH MEASURE — **Range, 0 to 12″** — by thousandths of an inch

or

METRIC MEASURE — **Range, 0 to 300 mm** — by hundredths of a millimeter

Without Ratchet Stops			With Ratchet Stops			Range	
No.	Price, either English or Metric		Have Ratchet Stops, No.	Price, either English or Metric		English Measure Inches	Metric Measure mm
	Without Standards	With Standards		Without Standards	With Standards		
*59	$7.25	....	*59RS	$7.75	....	0 to 1	0 to 25
**60	7.00	$8.00	**60RS	7.50	$8.50	1 to 2	25 to 50
61	8.00	9.00	61RS	8.50	9.50	1 to 2	25 to 50
**62	7.75	9.00	**62RS	8.25	9.50	2 to 3	50 to 75
63	8.75	10.00	63RS	9.25	10.50	2 to 3	50 to 75
65	9.50	11.00	65RS	10.00	11.50	3 to 4	75 to 100
67	10.25	12.00	67RS	10.75	12.50	4 to 5	100 to 125
69	11.00	13.00	69RS	11.50	13.50	5 to 6	125 to 150
71	12.00	14.25	71RS	12.50	14.75	6 to 7	150 to 175
72	13.00	15.50	72RS	13.50	16.00	7 to 8	175 to 200
73	14.00	16.75	73RS	14.50	17.25	8 to 9	200 to 225
74	15.00	18.00	74RS	15.50	18.50	9 to 10	225 to 250
75	16.00	19.25	75RS	16.50	19.75	10 to 11	250 to 275
76	17.00	20.50	76RS	17.50	21.00	11 to 12	275 to 300

*For similar tool without clamp ring, see No. 11, page 240. **Does not have clamp ring.
Furnished without Standards, unless otherwise ordered.
Each of the above packed one in a box.

59 to 76

59A to 65A

59 RS to 76 RS

59A RS to 65A RS

Micrometer Calipers Nos. 59A to 65A and 59ARS to 65ARS

Have Clamp Rings — ***Patented***

Range, 0 to 4″ by **ten-thousandths** as well as thousandths of an inch.

Without Ratchet Stops			With Ratchet Stops			Range Inches
No.	Price		Have Ratchet Stops, No.	Price		
	Without Standards	With Standards		Without Standards	With Standards	
†59A	$9.00	....	†59ARS	$9.50	....	0-1
61A	9.75	$10.75	61ARS	10.25	$11.25	1-2
63A	10.50	11.75	63ARS	11.00	12.25	2-3
65A	11.25	12.75	65ARS	11.75	13.25	3-4

†For similar tool without clamp ring, see No. 11A, page 241.
For reading Micrometers with ten-thousandth graduations, see page 230.
Furnished without Standards unless otherwise ordered.

Cases

‡Tool No.	59	60 and 61	62 and 63	65	67	69
Price of Case	$1.25	$1.60	$3.00	$3.50	$4.00	$4.75

‡Same cases can be used for tools with or without ratchet stops.
Each of the above packed one in a box.

Micrometer Calipers Nos. 90, 90RS, 91, 91RS, 92 & 92RS

Patented

ENGLISH MEASURE or METRIC MEASURE

Range, 12″ to 24″ by thousandths of an inch

Range, 300 mm to 600 mm by hundredths of a millimeter

90

90 RS

91

91 RS

92

92 RS

These micrometer calipers in 3 sizes, do the work of a more expensive set of twelve micrometers. The range of measurement is obtained by interchangeable anvils of different lengths. Each anvil has separate means of adjustment for wear. Each micrometer is furnished in a finished wooden case with four Standards.

Illustration shows tool with Ratchet Stop

Have Clamp Rings With or Without Ratchet Stops

No.	Range		Price
	English Measure	Metric Measure	
90	12″ to 16″	300 mm to 400 mm	$44.50
90RS (Has Ratchet Stop)	12″ to 16″	300 mm to 400 mm	45.00
91	16″ to 20″	400 mm to 500 mm	51.50
91RS (Has Ratchet Stop)	16″ to 20″	400 mm to 500 mm	55.00
92	20″ to 24″	500 mm to 600 mm	64.50
92RS (Has Ratchet Stop)	20″ to 24″	500 mm to 600 mm	65.00

Each of the above packed one in a box.

Larger sizes made to order. Prices on application.

Heavy Micrometer Calipers Nos. 100RS, 102RS and 104RS

Designed Especially for the Grinding Room

100 RS

These Micrometers are designed to meet the demands of constant and severe use, under adverse conditions, such as in the dirt and moisture of grinding rooms or where it is desired to take frequent measurements with the Clamp Ring set. They are easy to read and are well adapted for inspection purposes. Their frame is of heavy I-section, and they have a much heavier spindle and threaded portion than is generally used in Micrometers. This gives greater stiffness and insures longer life to the screw under adverse conditions because of the larger bearing surface for the threads.

Heavy Micrometer Caliper No. 100RS

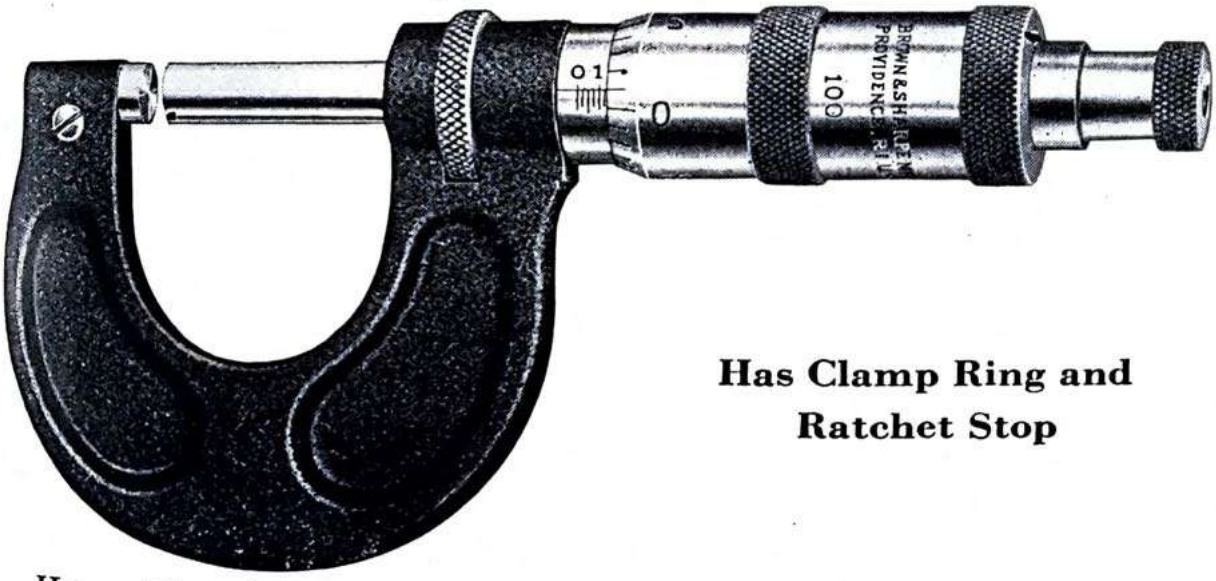
Patented

ENGLISH MEASURE
Range, 0 to 1″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 25 mm
by hundredths of a millimeter

Price, $12.00 Case, **$2.25**



Has Clamp Ring and Ratchet Stop

Heavy Micrometer Caliper No. 100RS can be furnished to read **ten-thousandths** as well as thousandths of an inch at an additional cost of $3.00.

Each of the above packed one in a box.

Heavy Micrometer Caliper No. 102RS

Patented

ENGLISH MEASURE or **METRIC MEASURE**

Range, 1″ to 2″ — by thousandths of an inch

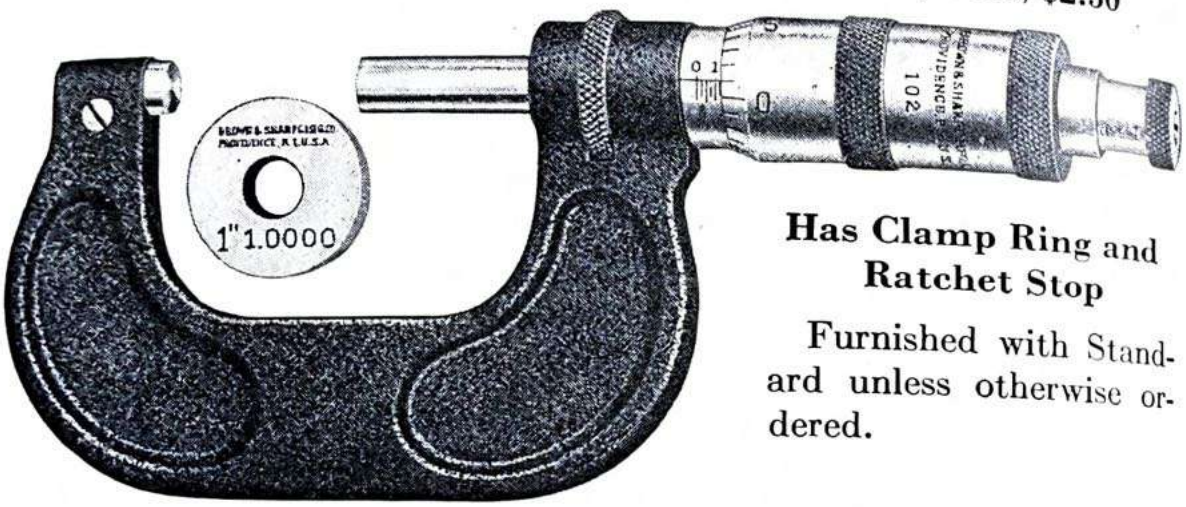
Range, 25 mm to 50 mm — by hundredths of a millimeter

Price

Without Standard, **$13.25**; With Standard, **$14.75**; Case, $2.50

102 RS

104 RS



Has Clamp Ring and Ratchet Stop

Furnished with Standard unless otherwise ordered.

Heavy Micrometer Caliper No. 104RS

Patented

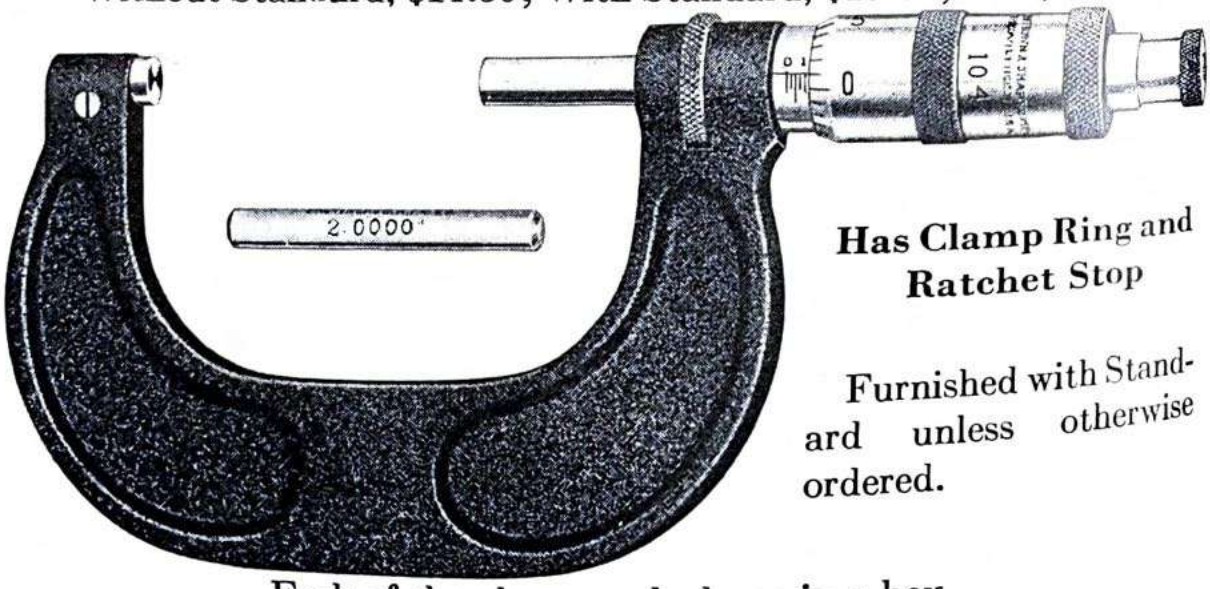
ENGLISH MEASURE or **METRIC MEASURE**

Range, 2″ to 3″ — by thousandths of an inch

Range, 50 mm to 75 mm — by hundredths of a millimeter

Price

Without Standard, **$14.50**; With Standard, **$15.75**; Case, $3.00



Has Clamp Ring and Ratchet Stop

Furnished with Standard unless otherwise ordered.

Each of the above packed one in a box.

Heavy Micrometer Caliper No. 110

Patent Pending

Range, 0 to .8″, by thousandths of an inch

Price, $19.00

110

Has Clamp Screw

ESPECIALLY developed for gaging sheet metal in rolling mills and for other work performed under severe conditions.

Has four important features:

1. Extra Rigid Frame.
2. Large Diameter Coarse Pitch Measuring Screw (Quick Action—Strong Threads).
3. Special Alloy, Wear-Resisting Measuring Points.
4. Other parts (except hardened anvil lock screw) of Stainless Steel.

Finger hole provides sure grip. Frame permits measurement 1″ from edge of work. Large diameter Measuring Screw (5/8″ approx.), has long bearing in nut which is integral with barrel. Thimble and screw are securely pinned together. Spindle is turned rapidly by small knurled end.

Screw has 20 threads per inch. The 50 graduations on thimble each represent .001″. The widely spaced graduations and large figures are placed on non-reflecting backgrounds to facilitate reading.

Measuring points of special alloy steel, chamfered to slide on and off work easily, far outwear points of best materials previously available. Anvil is adjustable for wear and is securely locked by special lock screw.

Stainless steel surfaces resist the rusting effects of water and fumes encountered in steel mill service.

Clamp Screw is reversible and can be used on both sides of frame.

This tool meets successfully and economically the adverse conditions and rough usage in steel mills and other places where precision measurements have heretofore been obtainable only at heavy expense for micrometer caliper maintenance.

Wooden Handle furnished as an extra. **Price,** Handle only . . . **$3.00**

Packed one in a box.

Micrometer Caliper Sets

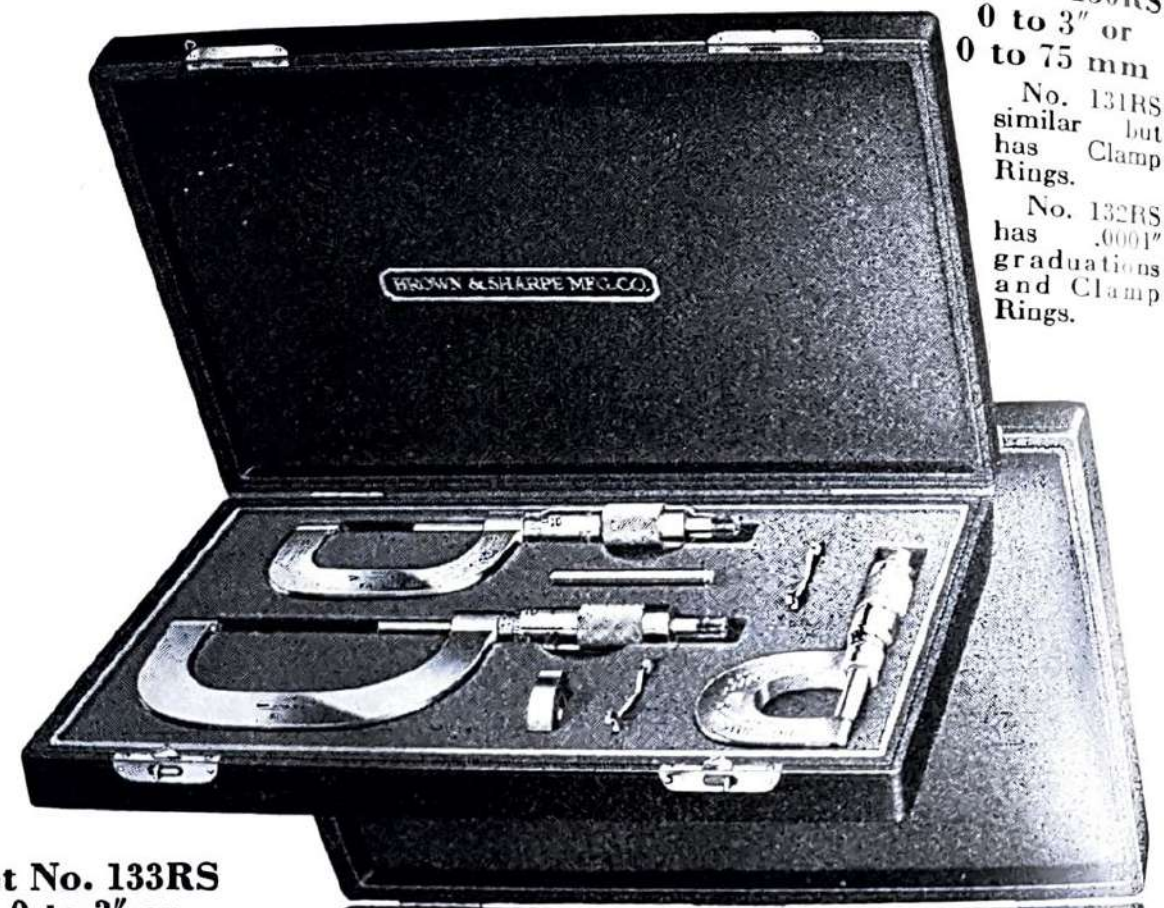
BROWN & SHARPE Micrometer Calipers are obtainable in convenient sets in combinations especially selected for various requirements. A case for each set is available, which serves to protect the tools and to provide a convenient place in which to keep them.

For prices see pages 272 to 274.

Set No. 130RS
0 to 3″ or
0 to 75 mm

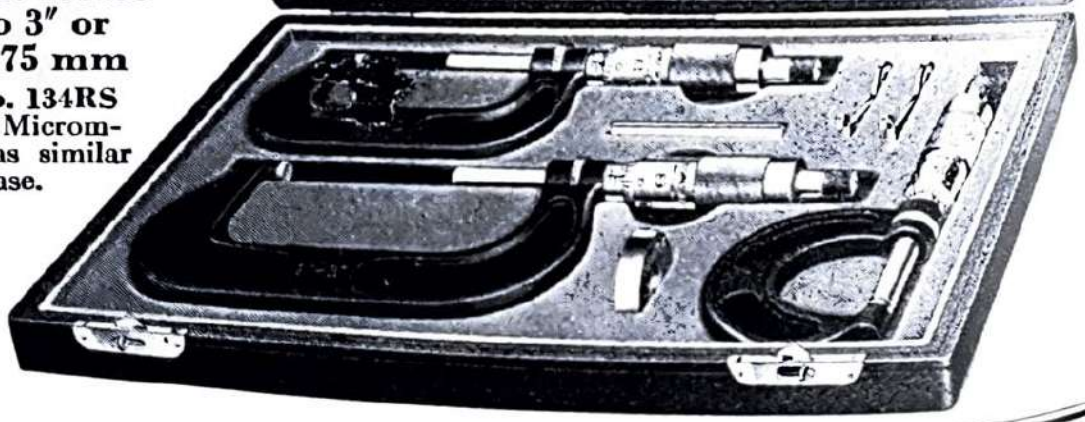
No. 131RS similar but has Clamp Rings.

No. 132RS has .0001″ graduations and Clamp Rings.

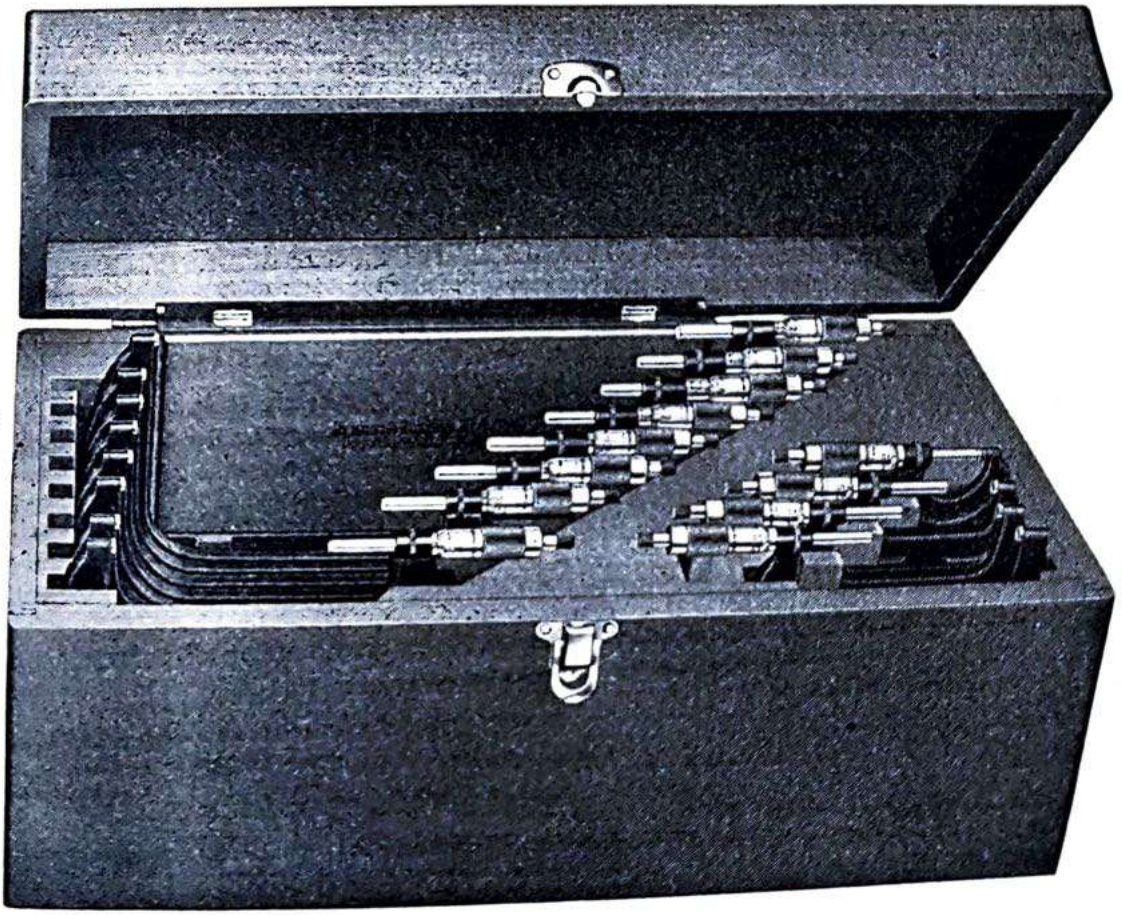


Set No. 133RS
0 to 3″ or
0 to 75 mm

Set No. 134RS Heavy Micrometers, has similar case.



Set No. 135RS
0 to 6″
or
0 to 150 mm



Set No. 138RS
0 to 12″
or
0 to 300 mm
(Note separate case for standards with this set.)

Set No. 137RS
Similar but has ranges
6″ to 12″
or
150 mm to 300 mm

Micrometer Caliper Sets Nos. 130 and 130RS

3 Micrometers
Patented
With or Without Ratchet Stops

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 3″ — by thousandths of an inch

Range, 0 to 75 mm — by hundredths of a millimeter

130

130 RS

			With Case	Without Case
Price	No. 130	Without Standards,	$33.50	$29.50
		With Standards	34.75	30.75
	No. 130RS, (Has Ratchet Stops)	Without Standards,	35.00	31.00
		With Standards,	36.25	32.25

Sets consist of Micrometer Calipers Nos. 19, 38 and 50 or 19RS, 38RS and 50RS.

131

Furnished in case with Standards, unless otherwise ordered.

Micrometer Caliper Sets Nos. 131 and 131RS

131 RS

3 Micrometers
Patented
With Clamp Rings and With or Without Ratchet Stops

132

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 3″ — by thousandths of an inch

Range, 0 to 75 mm — by hundredths of a millimeter

132 RS

			With Case	Without Case
Price	No. 131	Without Standards,	$36.50	$32.50
		With Standards,	37.75	33.75
	No. 131RS, (Has Ratchet Stops)	Without Standards,	38.00	34.00
		With Standards,	39.25	35.25

Sets consist of Micrometer Calipers Nos. 8, 47 and 52 or 8RS, 47RS and 52RS.

Furnished in case with Standards, unless otherwise ordered.

Micrometer Caliper Sets Nos. 132 and 132RS

3 Micrometers
Patented
With Clamp Rings and With or Without Ratchet Stops
Range, 0 to 3″
by **ten-thousandths** as well as thousandths of an inch.

			With Case	Without Case
Price	No. 132	Without Standards,	$41.75	$37.75
		With Standards,	43.00	39.00
	No. 132RS, (Has Ratchet Stops)	Without Standards,	43.25	39.25
		With Standards,	44.50	40.50

Sets consist of Micrometer Calipers Nos. 10, 48 and 53 or 10RS, 48RS and 53RS.

Furnished in case with Standards, unless otherwise ordered.

Each of the above packed one set in a box.

Micrometer Caliper Sets Nos. 133 and 133RS

Patented

3 Micrometers
With Clamp Rings and With or Without Ratchet Stops

ENGLISH MEASURE Range, 0 to 3″ by thousandths of an inch	or	METRIC MEASURE Range, 0 to 75 mm by hundredths of a millimeter

			With Case	Without Case	
Price	No. 133	Without Standards,	$28.00	$24.00	133
		With Standards,	30.25	26.25	
	No. 133RS, (Has Ratchet Stops)	Without Standards,	29.50	25.50	133
		With Standards,	31.75	27.75	RS

Sets consist of Micrometer Calipers Nos. 59, 61 and 63 or 59RS, 61RS and 63RS. Furnished in case with Standards unless otherwise ordered.

If desired, Micrometer Calipers Nos. 11, 60 and 62, or 11RS, 60RS and 62RS can be furnished in these sets at a reduction of $3.00 from above prices. 134 RS

Heavy Micrometer Caliper Set No. 134RS 135

Patented

3 Micrometers
With Clamp Rings and With Ratchet Stops 135 RS

ENGLISH MEASURE Range, 0 to 3″ by thousandths of an inch	or	METRIC MEASURE Range, 0 to 75 mm by hundredths of a millimeter

Price, With Case
Without Standards, **$44.75** With Standards, **$47.00**

Price, Without Case
Without Standards, **$39.75** With Standards, **$42.00**

Set consists of Heavy Micrometer Calipers Nos. 100RS, 102RS and 104RS. Furnished in case and with Standards unless otherwise ordered.

Micrometer Caliper Sets Nos. 135 and 135RS

Patented

6 Micrometers
With Clamp Rings and With or Without Ratchet Stops

ENGLISH MEASURE Range, 0 to 6″ by thousandths of an inch	or	METRIC MEASURE Range, 0 to 150 mm by hundredths of a millimeter

			With Case	Without Case
Price	No. 135	Without Standards,	$62.25	$54.75
		With Standards,	69.75	62.25
	No. 135RS, (Has Ratchet Stops)	Without Standards,	65.25	57.75
		With Standards,	72.75	65.25

Sets consist of Micrometer Calipers Nos. 59, 61, 63, 65, 67 and 69 or Nos. 59RS, 61RS, 63RS, 65RS, 67RS and 69RS. Furnished in case with Standards, unless otherwise ordered.

Each of the above packed one set in a box.

Micrometer Caliper Sets Nos. 137 and 137RS

6 Micrometers *Patented*

With Clamp Rings and With or Without Ratchet Stops

ENGLISH MEASURE	or	**METRIC MEASURE**
Range, 6 to 12″ by thousandths of an inch		**Range, 150 mm to 300 mm** by hundredths of a millimeter

137

137 RS

Price	**No. 137**	Without Standards, $93.00 With Standards, 110.25
	No. 137RS, (Has Ratchet Stops)	Without Standards, 96.00 With Standards, 113.25

Sets consist of Micrometer Calipers Nos. 71, 72, 73, 74, 75 and 76, or 71RS, 72RS, 73RS, 74RS, 75RS and 76RS. Furnished in a finished wooden case. Furnished with Standards unless otherwise ordered.

138

Micrometer Caliper Sets Nos. 138 and 138RS

138 RS

12 Micrometers *Patented*

With Clamp Rings and With or Without Ratchet Stops

ENGLISH MEASURE	or	**METRIC MEASURE**
Range, 0 to 12″ by thousandths of an inch		**Range, 0 to 300 mm** by hundredths of a millimeter

Price	**No. 138**	Without Standards, $151.25 With Standards, 176.00
	No. 138RS, (Has Ratchet Stops)	Without Standards, 157.25 With Standards, 182.00

Sets consist of Micrometer Calipers Nos. 59, 61, 63, 65, 67, 69, 71, 72, 73, 74, 75 and 76, or 59RS, 61RS, 63RS, 65RS, 67RS, 69RS, 71RS, 72RS, 73RS, 74RS and 75RS. Furnished in a finished wooden case. Furnished with Standards unless otherwise ordered.

Each of the above packed one set in a box.

Thread Measurements

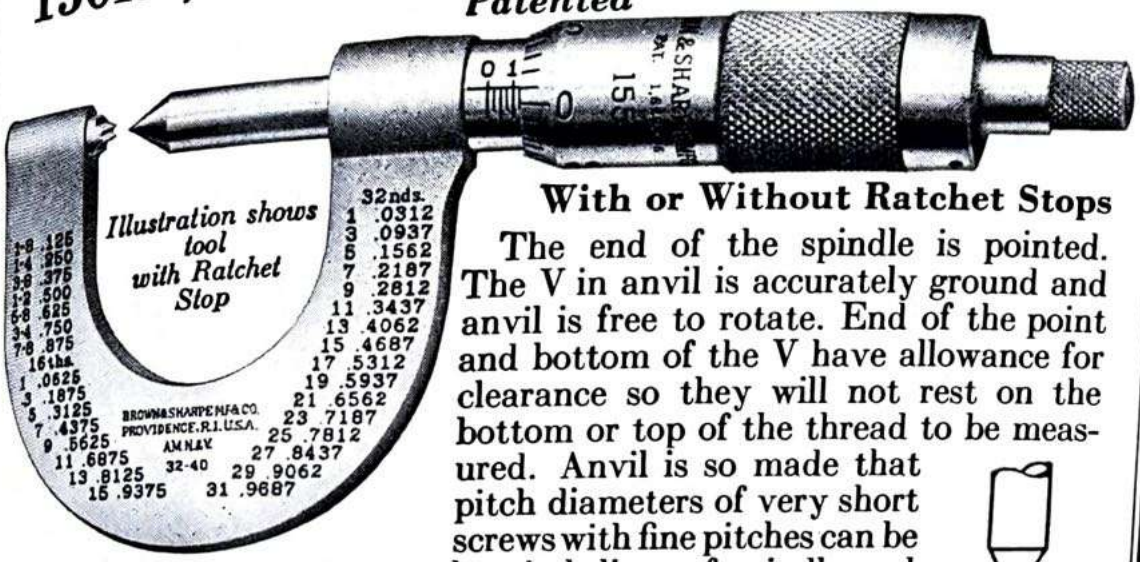
Two methods of measuring threads are in common use, Thread Micrometers and the Three Wire System. We offer equipment for both.

Thread Micrometers are fast and convenient but subject to certain limitations. When set to read 0 with the thimble and anvil together, as is usually done, their readings over threads are always slightly distorted, the amount of distortion depending upon the helix angle of the thread being measured. The readings are not distorted when Thread Micrometers are set to a standard thread plug and used for measuring threads having same pitch and diameter as that plug. When so set, however, the tool does not read exactly 0 when thimble and anvil are brought together.

The Three Wire System is not as fast or as convenient as the Thread Micrometer, but is theoretically correct. It should be noted, however, that the wires must be held very closely to theoretical size, as any error in the wires is multiplied when the thread dimensions are calculated.

Screw Thread Micrometer Calipers Nos. 150, 150RS, 152 to 159 and 152RS to 159RS

Patented



150

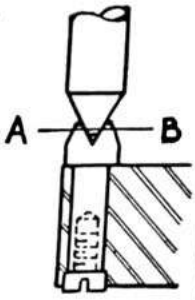
150 RS

152 to 159

152 RS to 159 RS

With or Without Ratchet Stops

The end of the spindle is pointed. The V in anvil is accurately ground and anvil is free to rotate. End of the point and bottom of the V have allowance for clearance so they will not rest on the bottom or top of the thread to be measured. Anvil is so made that pitch diameters of very short screws with fine pitches can be measured. When set at zero, the pitch lines of spindle and anvil coincide as AB. When the caliper is opened, the reading represents the distance between the two pitch lines or the pitch diameter. As the thread itself is measured, the actual outside diameter of the piece does not enter into consideration.



No.	Price	(Has Ratchet Stop) No.	Price	Capacity, Inches	Threads Per Inch	Case Price
*150	$11.50	*150RS	$12.00	1-2	48 to 64	$1.20
**152	12.00	**152RS	12.50	1	8 to 13	1.25
153	12.00	153RS	12.50	1	14 to 20	1.25
154	12.00	154RS	12.50	1	22 to 30	1.25
155	12.00	155RS	12.50	1	32 to 40	1.25
156	14.50	156RS	15.00	2	4 1-2 to 7	1.60
**157	14.50	**157RS	15.00	2	8 to 13	1.60
158	14.50	158RS	15.00	2	14 to 20	1.60
159	14.50	159RS	15.00	2	22 to 30	1.60

**Whitworth Standard, range 8 to 12 threads per inch only. *Not for Whitworth Standard.

Tools are furnished for (1) V and American National or United States Standard, and (2) for Whitworth Standard Threads.

When ordering specify thread form to be measured.

A Standard is furnished for adjusting the 2″ Micrometers.

Metric Measure. Also furnished in corresponding metric sizes for (1) V and American National or United States Standard, and (2) Whitworth Standard Threads.

Special Screw Thread Micrometer Calipers can be furnished. Prices and ranges upon request.

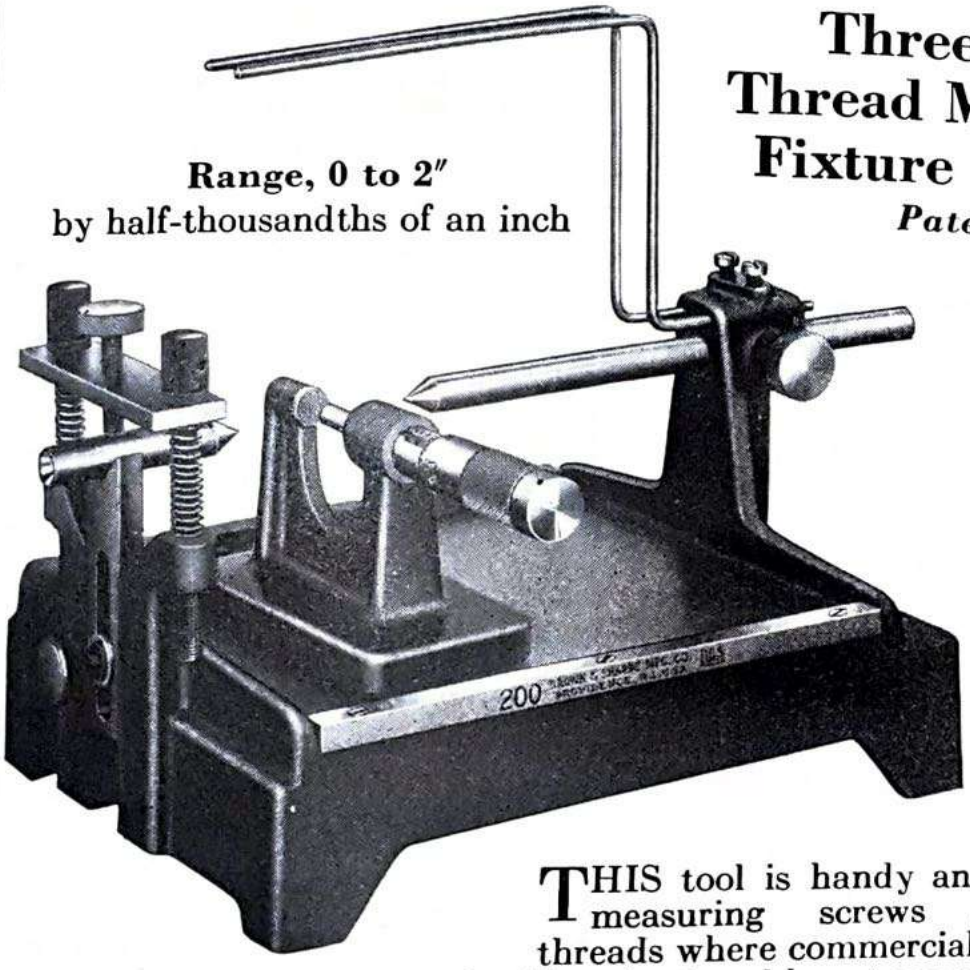
Each of the above packed one in a box.

Three Wire Thread Measuring Fixture No. 200

Patented

Range, 0 to 2″
by half-thousandths of an inch

200



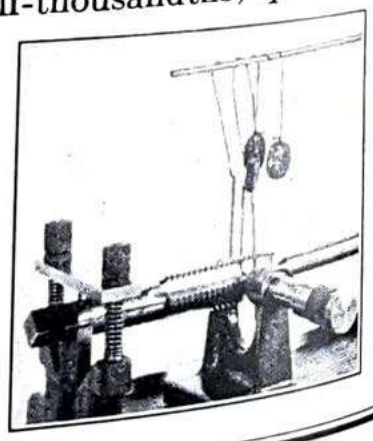
Price, $50.00
Furnished with two Micrometer Calipers and one Standard for adjusting 2″ Micrometer.

THIS tool is handy and accurate for measuring screws and external threads where commercial tolerances are allowable. It is useful for checking short and long taps with even numbers of flutes, and for inspecting external thread gages for wear. See pages 646 and 647 for tables.

The parts to be measured are held between the center, which is adjustable, and the "V" slide, also adjustable to accommodate parts of diameters from 3-16″ to 1 3-4″ (see small illustration).

Two Micrometer Calipers are furnished. One measures from 0 to 1″; one from 1″ to 2″. In use, the Micrometer Caliper floats on steel balls, which permits the measuring faces to be squared with measuring wires.

The Micrometers are graduated to read half-thousandths; quarter-thousandths are readily estimated; note extra size anvil, 3-8″ in diameter, which gives large measuring surface for two wires.



An auxiliary shaft, with center on one end and bell mouth on other, is furnished for measuring short taps, taps with pointed ends and similar pieces.

Adjustable supports are provided for holding measuring wires (see following page).

Packed one in a box.

"Best Size" Calibrated Wires

CALIBRATED measuring wires for use with Three Wire Thread Measuring Fixture No. 200 can be furnished in "Best Sizes" for 60° angle thread, tagged with decimal size, to measure any of the following pitches: 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 24, 26, 27, 28 and 30. One set required for each pitch. **Price,** per set of 3, **$5.00.** Wires for other pitches and for threads other than 60° to order. Price on application. 202

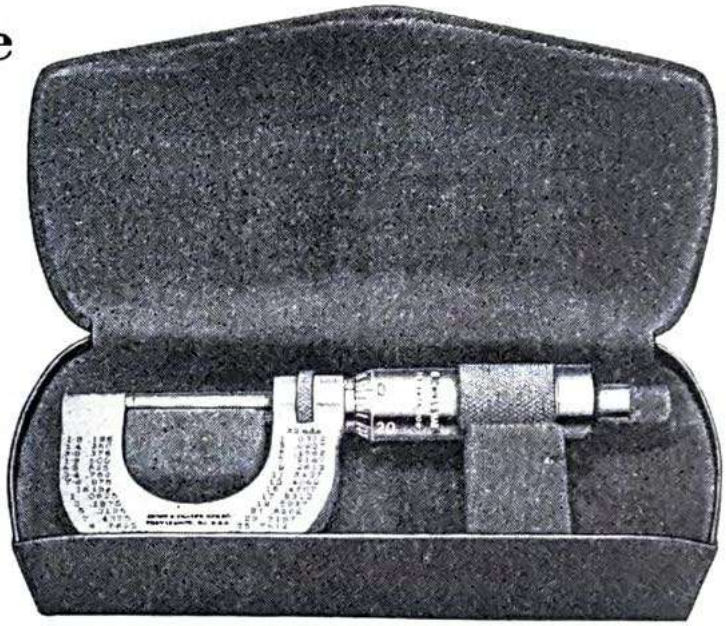
Micrometer Case No. 202

Price, 75 cents

This micrometer case is light and handy and protects the micrometer from dirt and grit. It fits the pocket nicely, is small and neat and does not cause the pocket to bulge.

The case is substantially made of steel with a strong spring cover, plush lined and covered with imitation leather.

Packed one in a box.



For Micrometers Nos.

8	8S	10	10S	11	11A	12
8RS,	8SRS,	10RS,	10SRS,	11RS,	11ARS,	12RS,
13	15	17	19	20	24	59
13RS,	15RS,	17RS,	19RS,	20RS,	24RS,	59RS,
59A	152	153	154	155	215	228
59ARS,	152RS,	153RS,	154RS,	155RS,	215RS	

Soft Leather Cases For Micrometer Calipers

Price, 50 cents

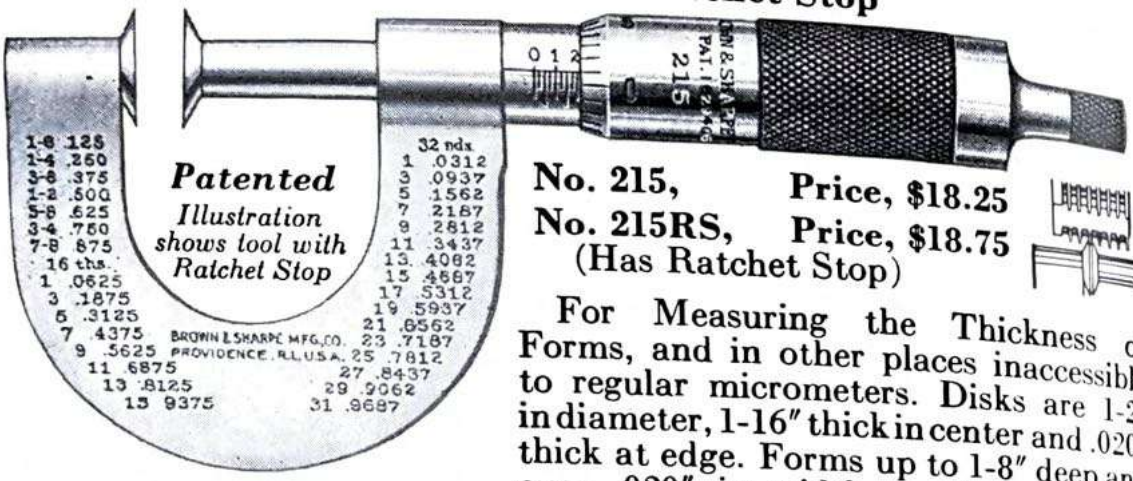
Made to hold all micrometer calipers of 1-2″, 1″ and 2″ capacity, except Nos. 100 and 102 Heavy Micrometers.

When ordering give size of caliper with which case is to be used.

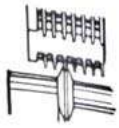
Packed one in a box.

Micrometer Calipers Nos. 215 and 215RS

Disk Anvil Type—For Measuring Forming Tools
Range, 0 to 1″—by thousandths of an inch
With or Without Ratchet Stop



No. 215, Price, $18.25
No. 215RS, Price, $18.75
(Has Ratchet Stop)

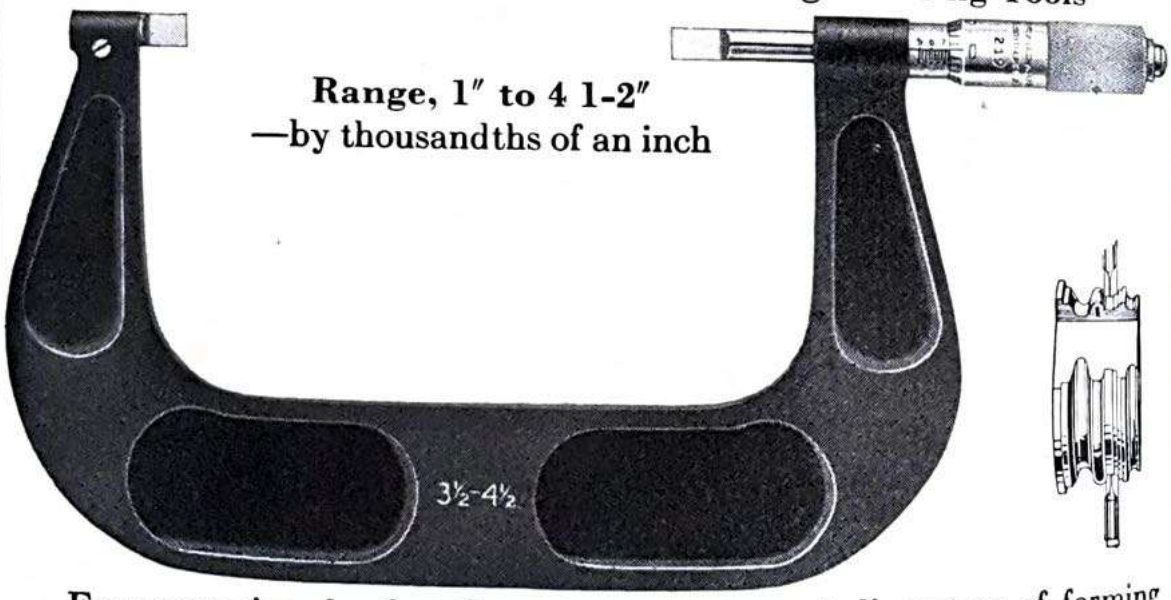


For Measuring the Thickness of Forms, and in other places inaccessible to regular micrometers. Disks are 1-2″ in diameter, 1-16″ thick in center and .020″ thick at edge. Forms up to 1-8″ deep and over .020″ in width can be measured.

Micrometer Calipers Nos. 216 to 219

Blade Anvil Type—For Measuring Forming Tools

Range, 1″ to 4 1-2″
—by thousandths of an inch



For measuring depths of narrow grooves and diameters of forming tools. The blade on spindle end does not rotate. Blades are .030″ thick and permit measurements in slots having a depth up to 7-32″.

No.	Range, by thousandths of an Inch	Price
216	1″ to 2″	$45.00
217	1 1-2″ to 2 1-2″	45.00
218	2 1-2″ to 3 1-2″	45.00
219	3 1-2″ to 4 1-2″	45.00

Each of the above packed one in a box.

Micrometer Calipers Nos. 225 and 225RS

For Measuring the Thickness of Tubing

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1-2″ by thousandths of an inch

Range, 0 to 13 mm by hundredths of a millimeter

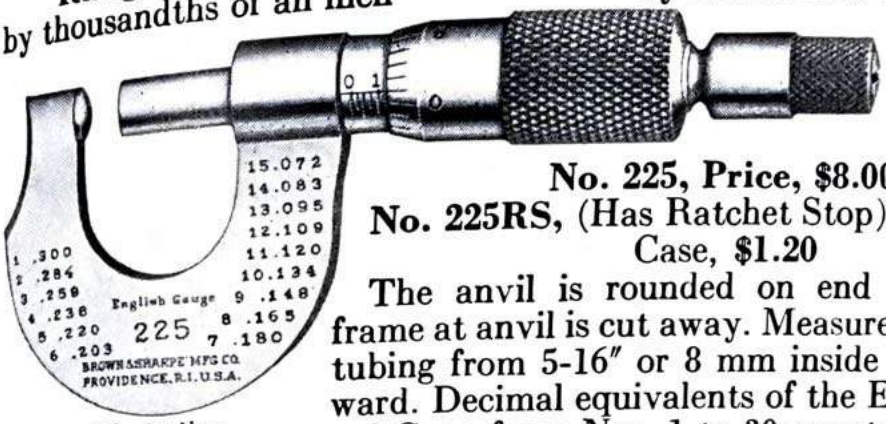


Illustration shows tool with Ratchet Stop

With or Without Ratchet Stop

No. 225, Price, $8.00

No. 225RS, (Has Ratchet Stop) **Price, $8.50**

Case, **$1.20**

The anvil is rounded on end and back of frame at anvil is cut away. Measures thickness of tubing from 5-16″ or 8 mm inside diameter upward. Decimal equivalents of the English Standard Gage from Nos. 1 to 30 are stamped on the frame (omitted on Metric Micrometer).

Packed one in a box.

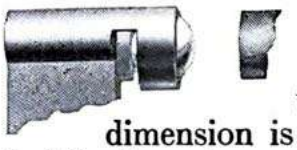
225

225 RS

226

228

Ball Anvil Attachment No. 226



Price, 50 cents

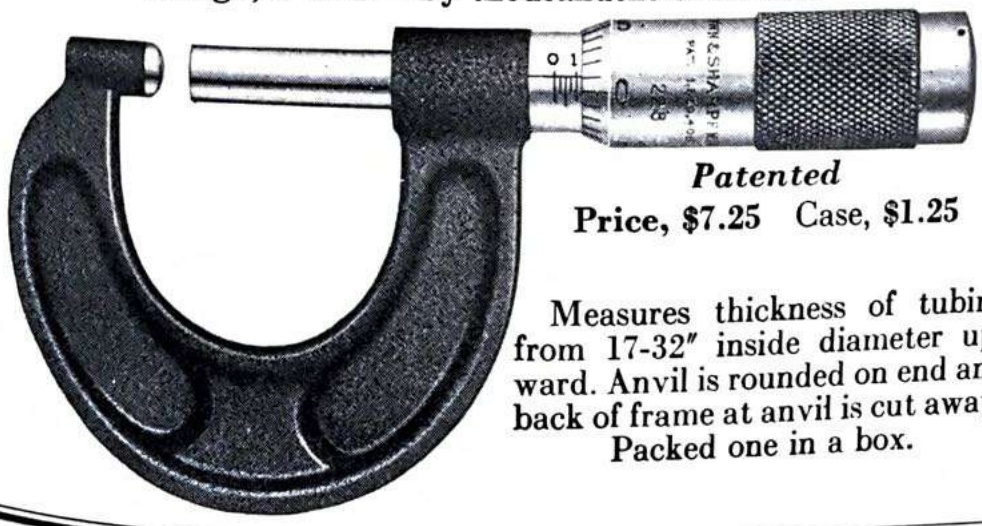
Easily applied. Equips a micrometer to measure tubing. The ball is .250″ in diameter, and this dimension is subtracted from the actual caliper reading. Fits the following micrometers: Nos. 8, 8RS, 8S, 8SRS, 10, 10RS, 10S, 10SRS, 12, 12RS, 13, 13RS, 19, 19RS, 20, 20RS, 24, 24RS, 38, 38RS, 47, 47RS, 48, 48RS, 50, 50RS. 52, 52RS, 53 and 53RS.

Packed twelve in a box.

Micrometer Caliper No. 228

For Measuring the Thickness of Tubing

Range, 0 to 1″—by thousandths of an inch



Patented

Price, $7.25 Case, **$1.25**

Measures thickness of tubing from 17-32″ inside diameter upward. Anvil is rounded on end and back of frame at anvil is cut away.

Packed one in a box.

Paper Gage Micrometer Calipers
Nos. 230 and 230RS

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 3-8″ by thousandths of an inch

Range, 0 to 9 mm by hundredths of a millimeter

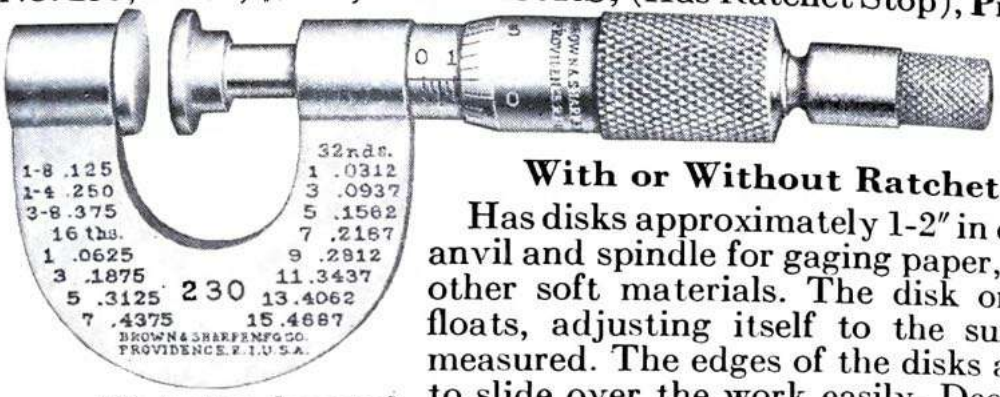
No. 230, Price, $9.50; No. 230RS, (Has Ratchet Stop), **Price, $10.00**

230

230 RS

232

232 RS



Case, $1.20

Illustration shows tool with Ratchet Stop

With or Without Ratchet Stop

Has disks approximately 1-2″ in diameter on anvil and spindle for gaging paper, rubber and other soft materials. The disk on the anvil floats, adjusting itself to the surface being measured. The edges of the disks are rounded to slide over the work easily. Decimal equivalents omitted on Metric micrometer.

Paper Gage Micrometer Calipers
Nos. 232 and 232RS

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 3-8″ by thousandths of an inch

Range, 0 to 9 mm by hundredths of a millimeter

No. 232, Price, $12.50

No. 232RS, (Has Ratchet Stop), **Price, $13.00** Case, $2.50

With or Without Ratchet Stop

Illustration shows tool with Ratchet Stop

Has disks approximately 1-2″ in diameter on anvil and spindle for gaging paper, rubber and other soft materials. The disk on the anvil floats, adjusting itself to the surface being measured. The edges of the disks are rounded to slide over the work easily. The deep opening in frame permits measurements to be taken 2″ from edge of material being gaged.

Each of the above packed one in a box.

Micrometer Caliper No. 233RS

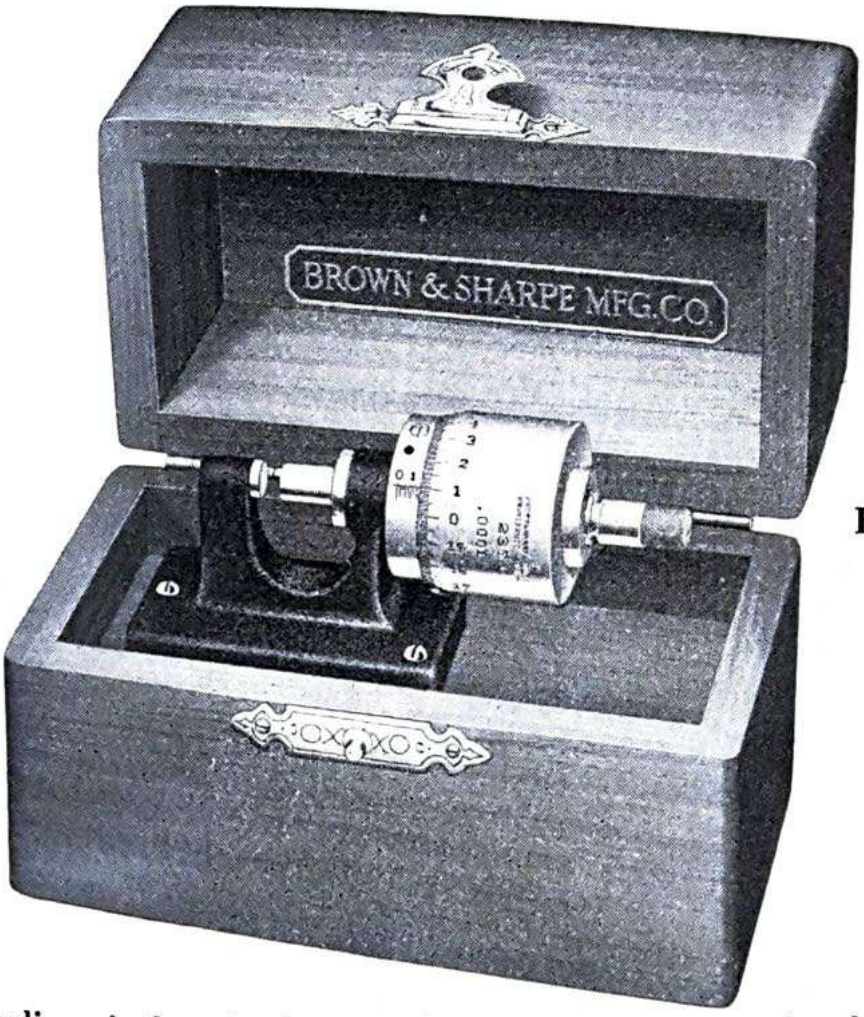
ENGLISH MEASURE
Range, 0 to 1-2″
by .0001″

or

METRIC MEASURE
Range, 0 to 13 mm
by .0025 mm

Price, in Case, $30.00

233 RS



Has Ratchet Stop

This caliper is found of service to wire drawers, watchmakers, and others who desire fine measurements, and whose work is of such a class that a micrometer caliper can be used when placed on a bench.

It differs from our regular micrometers in that the measuring screw, English Measure, has 50 threads per inch, and the sleeve has 200 graduations, reading by one ten-thousandths of an inch. The measuring screw, Metric Measure, is 1-2 millimeter pitch and the sleeve has 200 graduations reading by one four-hundredths of a millimeter. The graduations are clean cut and easy to read.

Packed one in a box.

This Micrometer can be furnished with Tungsten Carbide Measuring Surfaces. Price, **$45.00.**

Micrometer Calipers Nos. 237 and 237RS

Patented

Rolling Mill Gage

ENGLISH MEASURE or **METRIC MEASURE**

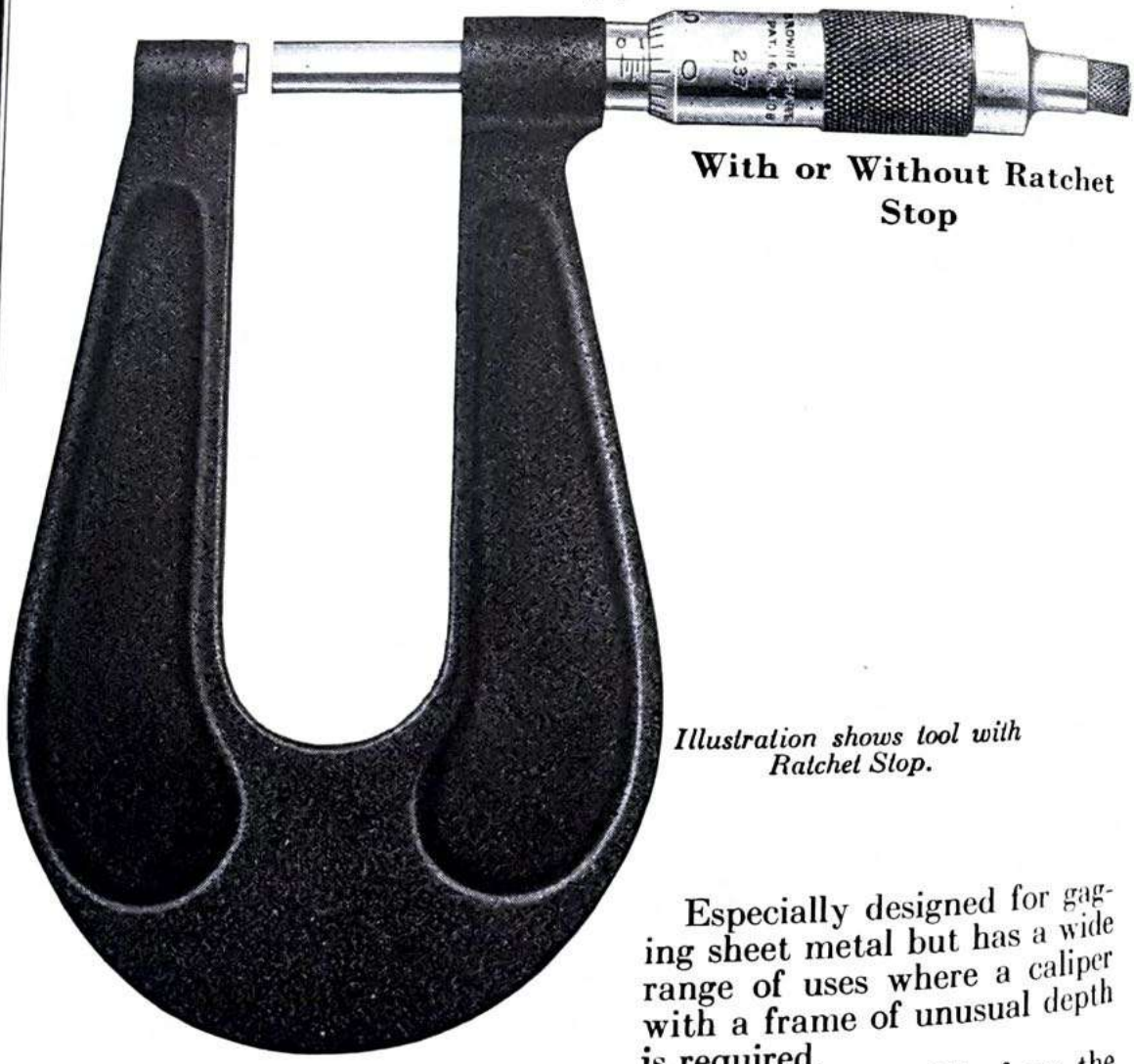
Range, 0 to 1″ — **Range, 0 to 25 mm**

237 by thousandths of an inch — by hundredths of a millimeter

No. 237, Price, $12.50

237 RS **No. 237RS,** (Has Ratchet Stop), **Price, $13.00**

Case, **$2.50**



With or Without Ratchet Stop

Illustration shows tool with Ratchet Stop.

Especially designed for gaging sheet metal but has a wide range of uses where a caliper with a frame of unusual depth is required.

With this caliper it is possible to take measurements 3″ in from the edge of the work.

For table of weights and thicknesses of iron and steel sheets and bars, see pages 648 to 652.

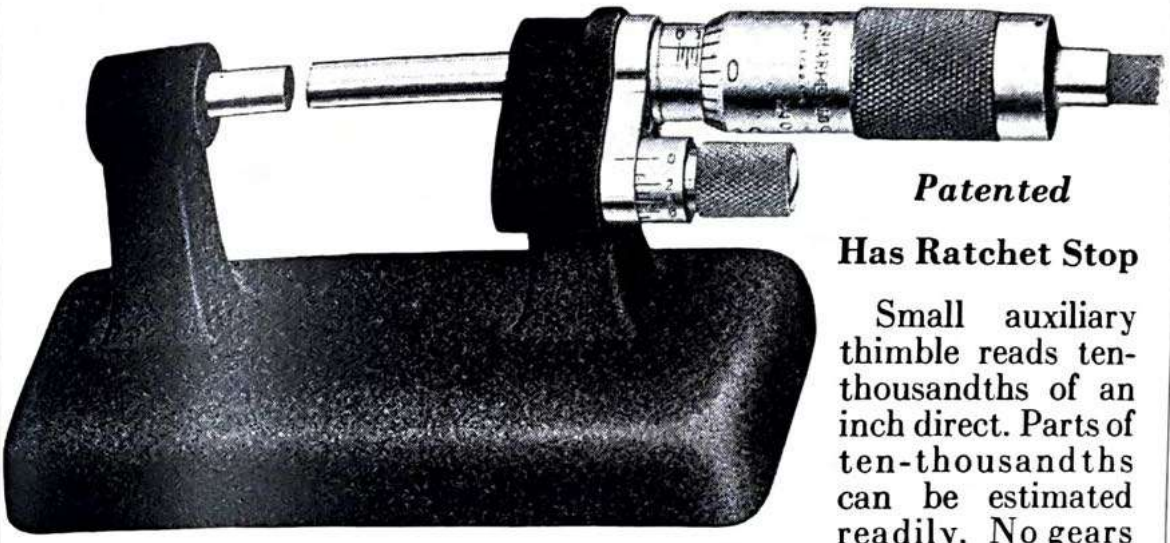
Packed one in a box.

Bench Micrometer Caliper No. 240RS

Range, 0 to 1″

by ten-thousandths as well as thousandths of an inch

Price, $25.00



240 RS

243 RS

Patented

Has Ratchet Stop

Small auxiliary thimble reads ten-thousandths of an inch direct. Parts of ten-thousandths can be estimated readily. No gears or intricate mechanisms to get out of order. (See page 251.)

Particularly useful to watchmakers, inspectors, manufacturing jewelers etc., for very fine measurements. Base is rigid and heavy to prevent tool from being upset easily.

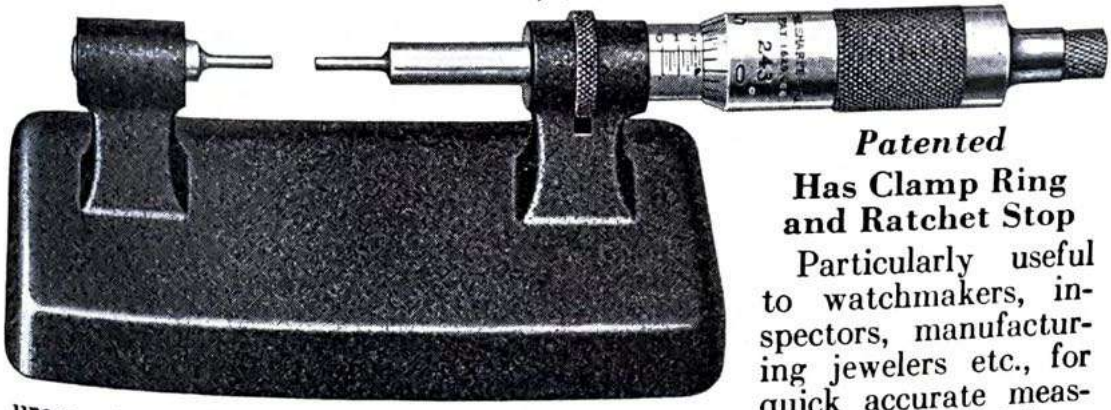
Bench Micrometer Caliper No. 243RS

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — **Range, 0 to 25 mm**

by thousandths of an inch — by hundredths of a millimeter

Price, $15.00



Patented

Has Clamp Ring and Ratchet Stop

Particularly useful to watchmakers, inspectors, manufacturing jewelers etc., for quick accurate measurements on the bench. Base is rigid and heavy and prevents tool from being upset easily. Spindle can be locked by clamp ring for series of uniform measurements.

Measuring points are 5-64″ (.078″) or 2 mm in diameter, facilitating measurement of small pieces and in narrow recesses.

Each of the above packed one in a box.

Depth of Gear Tooth Micrometer No. 249

ENGLISH MEASURE or **METRIC MEASURE**

Range, 0 to 1″ — by thousandths of an inch

Range, 0 to 25 mm — by hundredths of a millimeter

Price, $15.00 Case, **$1.25**

249

250

Has Clamp Screw

For scribing a line on gear blanks and particularly on bevel gear blanks, to indicate depth to cut teeth. Toolmakers find it handy as a scratch gage and in measuring spacing. Scriber Point is hardened.

Extra scriber points. Price, 40 cents each.

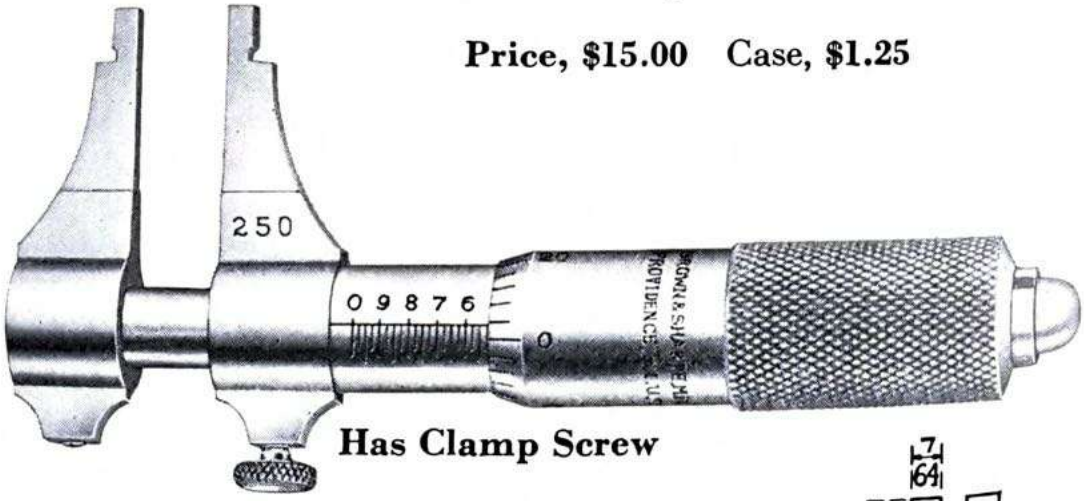
Inside Micrometer Caliper No. 250

ENGLISH MEASURE or **METRIC MEASURE**

Range, .200″ to 1″ — by thousandths of an inch

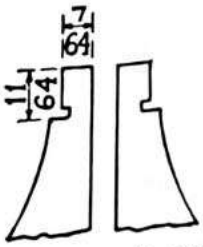
Range, 5 mm to 25 mm — by hundredths of a millimeter

Price, $15.00 Case, **$1.25**



Has Clamp Screw

Measures small internal dimensions. Measuring surfaces are hardened and ground on a radius to insure accurate measurements and prevent cramping.



Approximate dimensions of measuring jaws

Each of the above packed one in a box.

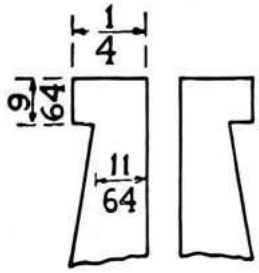
Inside Micrometer Caliper No. 252

ENGLISH MEASURE
Range, 1-2″ to 1 1-2″
by thousandths of an inch

or

METRIC MEASURE
Range, 12 mm to 37 mm
by hundredths of a millimeter

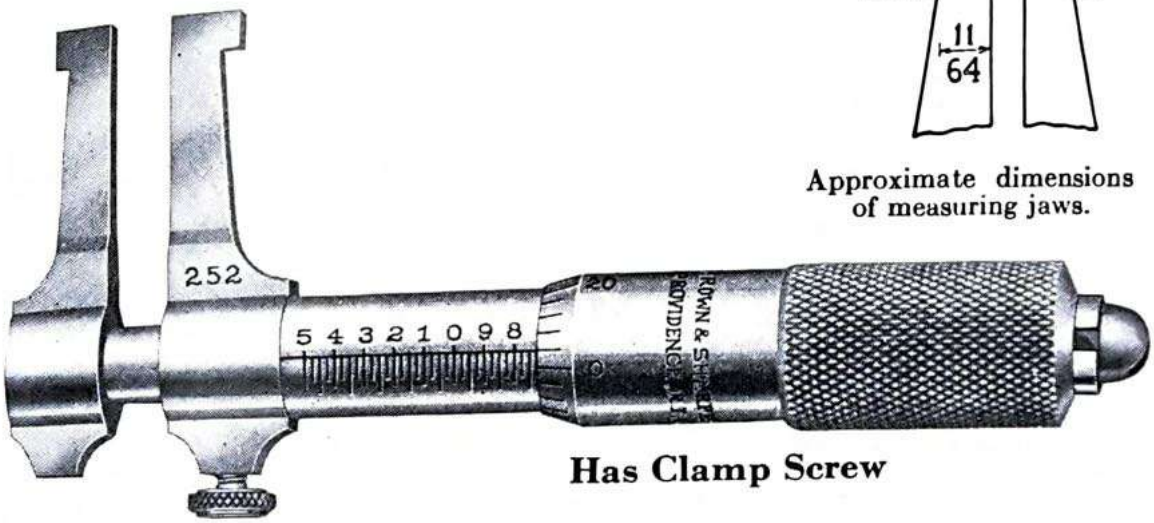
Price, $15.00 Case, **$1.50**



Approximate dimensions of measuring jaws.

252

254



Has Clamp Screw

The shape of the jaws of this tool enables the user to take inside measurements over a flange or shoulder. Note dimensions of jaws above.

Inside Micrometer Caliper No. 254

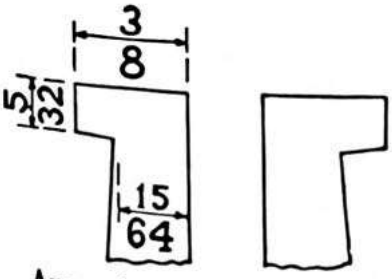
ENGLISH MEASURE
Range, 1″ to 2″
by thousandths of an inch

or

METRIC MEASURE
Range, 25 mm to 50 mm
by hundredths of a millimeter

Price, $15.00 Case, **$1.50**

Has Clamp Screw



Approximate dimensions of measuring jaws.

This tool is similar in design to No. 252 shown above but has wide jaws that permit inside measurements over a deeper flange or shoulder. Note dimensions of jaws opposite.

Each of the above packed one in a box.

Inside Micrometer No. 260

ENGLISH MEASURE
Range, 2″ to 9 1-2″
by thousandths of an inch
Has 5 Measuring Rods

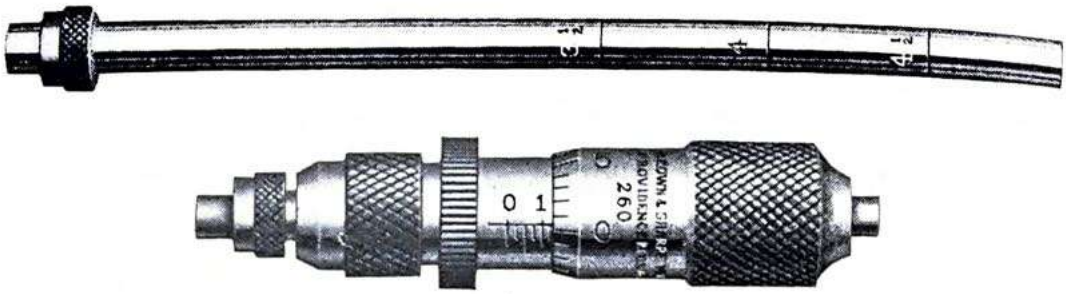
or

METRIC MEASURE
Range, 50 mm to 230 mm
by hundredths of a millimeter
Has 6 Measuring Rods

Price, $9.00 Case, **$1.75**

260 Price includes complete set of Measuring Rods

261



Consists of a holder with a micrometer screw and thimble, and extension rods that are graduated by a series of angular grooves of a form and depth that allow the clamping fingers to spring in and the adjustment to be made quickly and positively. The micrometer screw has 1-2″ movement.

(Attachment No. 598 is very useful in connection with this micrometer, making it a handy and accurate micrometer height gage.)

Inside Micrometer No. 261

ENGLISH MEASURE
Range, 2″ to 12 1-2″
by thousandths of an inch
Has 7 Measuring Rods

or

METRIC MEASURE
Range, 50 mm to 290 mm
by hundredths of a millimeter
Has 8 Measuring Rods

Price, $10.50 Case, **$2.75**

Price includes complete set of Measuring Rods

Similar to No. 260 except in the number of measuring rods. The micrometer screw has 1-2″ movement.

(Attachment No. 598 is very useful in connection with this micrometer, making it a handy and accurate micrometer height gage.)

Each of the above packed one in a box.

Inside Micrometer No. 262

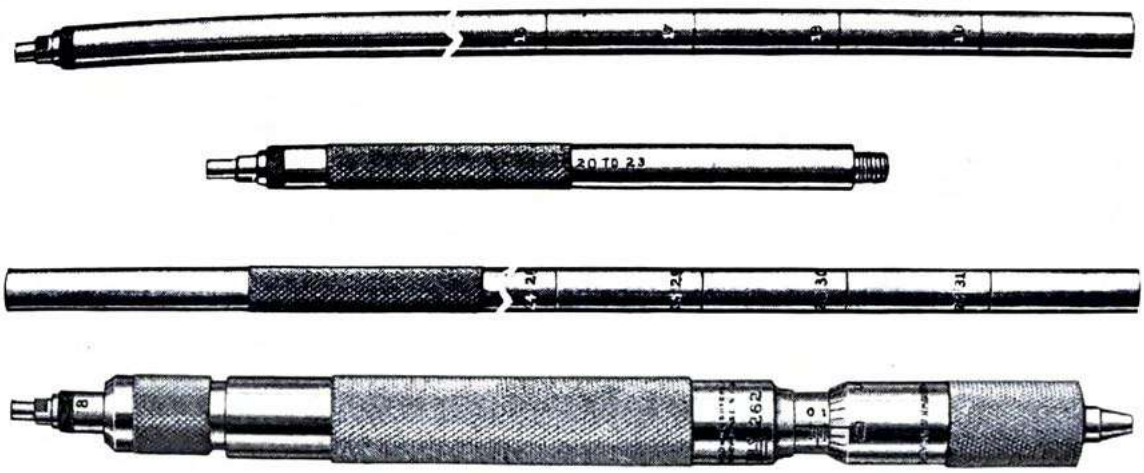
ENGLISH MEASURE
Range, 8″ to 36″
by thousandths of an inch
Has 7 Measuring Rods
and Extension

or

METRIC MEASURE
Range, 200 mm to 900 mm
by hundredths of a millimeter
Has 7 Measuring Rods
and Extension

262

Price, $15.00 Finished Wooden Case, **$5.00**
Price includes complete set of Measuring Rods and Extension



Consists of a holder with a micrometer screw and thimble and extension rods that are graduated by a series of angular grooves of a form and depth that allow the clamping fingers to spring in and the adjustments to be made quickly and positively. The micrometer screw has 1″ movement. For convenience in attaching the rods knurled finger grips are provided.

This style of micrometer is well adapted for use wherever it is desired to measure the inside diameters of rings, cylinders, and similar work of comparatively large size. It is especially useful where a big range of measurements is required. The adjustments are made easily and quickly.

Packed one in a box.

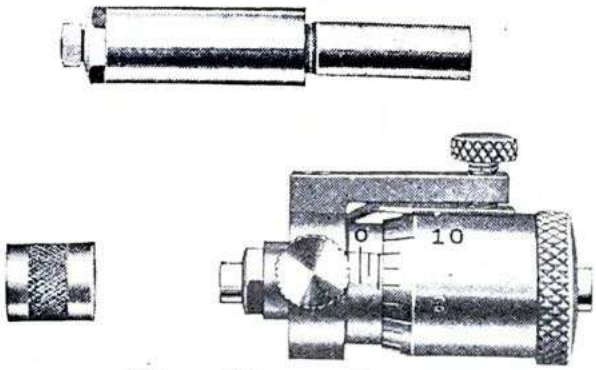
Inside Micrometer No. 263

Range, 1″ to 2″ by thousandths of an inch
Has 2 Measuring Rods

Price, $7.50 Case, $1.50
Price includes two Measuring Rods and Spacing Collar

263

263 M



Has Clamp Screw

This inside micrometer will take internal measurements from 1″ to 2″ by thousandths of an inch. It consists of a holder with a 1-4″ micrometer screw, two measuring rods and a spacing collar.

The thimble may be locked at any reading by tightening the thumb screw which presses the small brass shoe in contact with the thimble. This is an extremely convenient feature as it preserves the correct setting while the tool is in use.

With the short measuring rod only, the tool will measure from 1″ to 1 1-4″. By adding the spacing collar this range is increased to 1 1-2″. With the long measuring rod only, the tool will measure from 1 1-2″ to 1 3-4″. By adding the spacing collar, measurements may be taken up to 2″.

The measuring ends of the rods are hardened and so designed that it is possible to adjust them.

Inside Micrometer No. 263M

Has Clamp Screw

Same as No. 263 shown above but graduated in Metric Measure to read from 25 mm to 50 mm by hundredths of a mm.

Price, $7.50 Case, $1.50
Price includes two Measuring Rods and Spacing Collar

Inside Micrometer Handle No. 287 is very useful in connection with these micrometers.

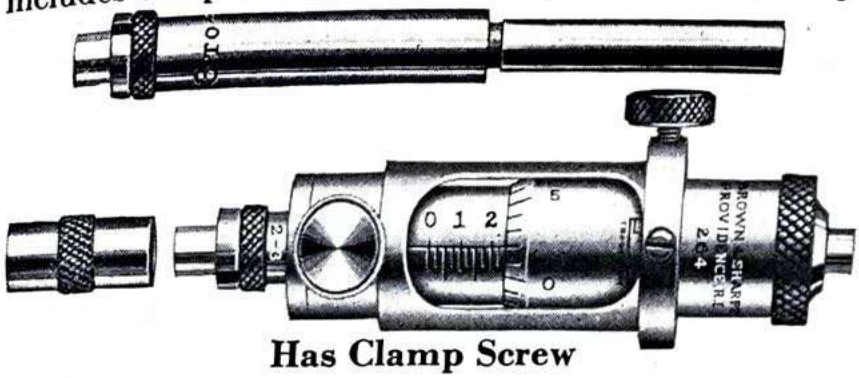
Each of the above packed one in a box.

Inside Micrometer No. 264

Range, 2″ to 8″ by thousandths of an inch
Has 6 Measuring Rods

Price, $10.00 Case, **$1.75**

Price includes complete set of Measuring Rods and Spacing Collar



Has Clamp Screw

264

264 M

265

265 M

Consists of holder with 1-2 inch micrometer screw and six measuring rods which measure from 2″ to 8″. Holder has clamping device which clamps thimble. When rod is in position with shoulder against head, first half of inch can be measured (example, 3″ to 3 1-2″). When spacing collar is in place on rod, last half of inch can be measured (example 3 1-2″ to 4″). Ends of rods hardened and adjustable for wear.

Inside Micrometer No. 264M — Has Clamp Screw

Same as No. 264 shown above but graduated in Metric Measure to read from 50 mm to 200 mm by hundredths of a mm.

Price, $10.00 Case, **$1.75**

Price includes complete set of Measuring Rods and Spacing Collar

Inside Micrometer No. 265 — Has Clamp Screw

Range, 2″ to 12″ by thousandths of an inch
Has 10 Measuring Rods

Price, $14.00 Case, **$2.50**

Price includes complete set of Measuring Rods and Spacing Collar

Similar to Inside Micrometer No. 264 shown above except that the ten measuring rods furnished increase its range.

Inside Micrometer No. 265M — Has Clamp Screw

Same as No. 265 listed above but graduated in Metric Measure to read from 50 mm to 300 mm by hundredths of a mm.

Price, $14.00 Case, **$2.50**

Price includes complete set of Measuring Rods and Spacing Collar.

Inside Micrometer Handle No. 287 is very useful in connection with these micrometers.

Each of the above packed one in a box.

Tubular Inside Micrometers Nos. 270 and 272

270

Have Clamp Screws

272

Tubular Inside Micrometers made of tubing are very light and convenient to handle.

They are designed for measuring by thousandths of an inch, or hundredths of a millimeter, inside diameters of rings, cylinders etc., setting calipers, comparing gages and work of a similar nature. They are fitted with micrometer head having 1-2″ or 1″ movement (Metric, 13 mm or 25 mm). Measuring points are hardened and faces are ground on a radius, adapting them for measuring parallel or curved surfaces.

Fibre grips guard against inaccuracies due to heat of hand. Small sizes have one grip, while larger sizes have two.

Each tool, with exception of size 2″ to 2 1-2″ and 50 mm to 63 mm. is provided with clamp screw which clamps spindle and preserves setting.

Inside Micrometer Handle No. 287 is very useful in connection with the smaller sizes of these micrometers.

ENGLISH MEASURE

No.	Range, Inches	Price, Each
270	*2 to 2 1-2	$7.00
	2 1-2 to 3	
	3 to 3 1-2	
	3 1-2 to 4	
	4 to 4 1-2	
	4 1-2 to 5	
	5 to 6	7.50
	6 to 7	
	7 to 8	
	8 to 9	
	9 to 10	
	10 to 11	8.00
	11 to 12	

METRIC MEASURE

No.	Range, Millimeters	Price, Each
272	*50 to 63	$7.00
	63 to 75	
	75 to 88	
	88 to 100	
	100 to 113	
	113 to 125	
	125 to 150	7.50
	150 to 175	
	175 to 200	
	200 to 225	
	225 to 250	
	250 to 275	8.00
	275 to 300	

*Differs from cut. No Clamp Screw is furnished.

Packed as follows:—The two larger sizes, one in a tubular container; all others, one in a box.

273

274

Tubular Inside Micrometer Set No. 273

7 Micrometers

ENGLISH MEASURE or **METRIC MEASURE**

Range, 2″ to 6″ by thousandths of an inch

Range, 50 mm to 150 mm by hundredths of a millimeter

Price, in finished wooden case, **$52.50**

Consists of Tubular Inside Micrometers Nos. 270 or 272

Tubular Inside Micrometer Set No. 274

13 Micrometers

ENGLISH MEASURE or **METRIC MEASURE**

Range, 2″ to 12″ by thousandths of an inch

Range, 50 mm to 300 mm by hundredths of a millimeter

Price, in finished wooden case, **$101.50**

Consists of Tubular Inside Micrometers Nos. 270 or 272

Each of the above packed one set in a box.

Tubular Inside Micrometers No. 276

276

Have Clamp Screws

287 Made for long inside measurements by thousandths of an inch or hundredths of a millimeter. Due to their tubular construction, they are light and easy to handle. They can be quickly and easily adjusted, and locked at any reading. Measuring points are hardened and faces are ground on a radius, adapting them for measuring parallel or curved surfaces.

Range of measurements is obtained by 10 changeable anvils of different lengths. Each anvil has means of adjustment for wear. Shoulders of anvils fit against shoulder of micrometer head insuring accurate measurements. Anvils are held by clamp screw fitting into a V groove.

Each tool is furnished in finished wooden case with set of ten anvils.

No.	Range		Price
	English Measure	Metric Measure	
276	12″ to 22″	300 mm to 550 mm	$42.50
	22 to 32	550 to 800	46.00
	32 to 42	800 to 1050	50.00

Inside Micrometer Handle No. 287

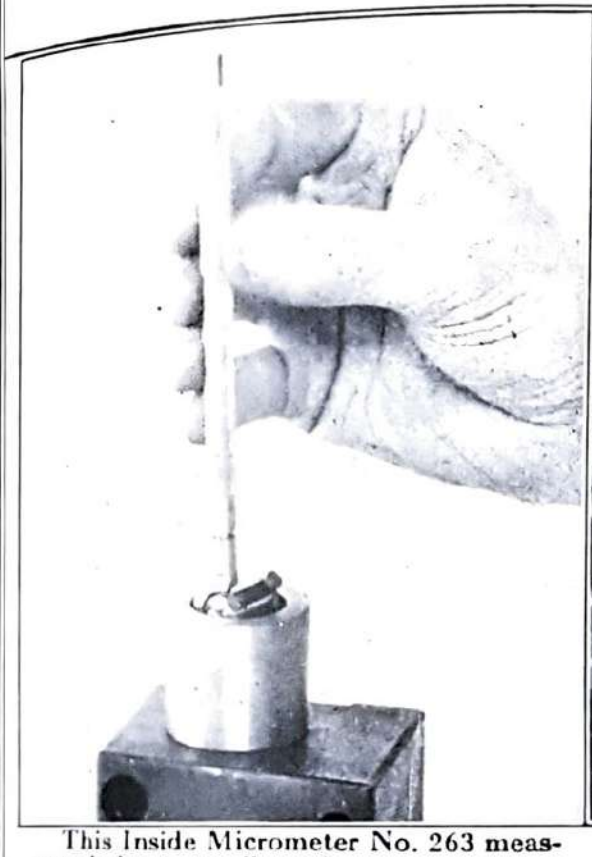
For Micrometers Nos. 263, 263M, 264, 264M, 265, 265M, 270 and 272

Price, $1.00

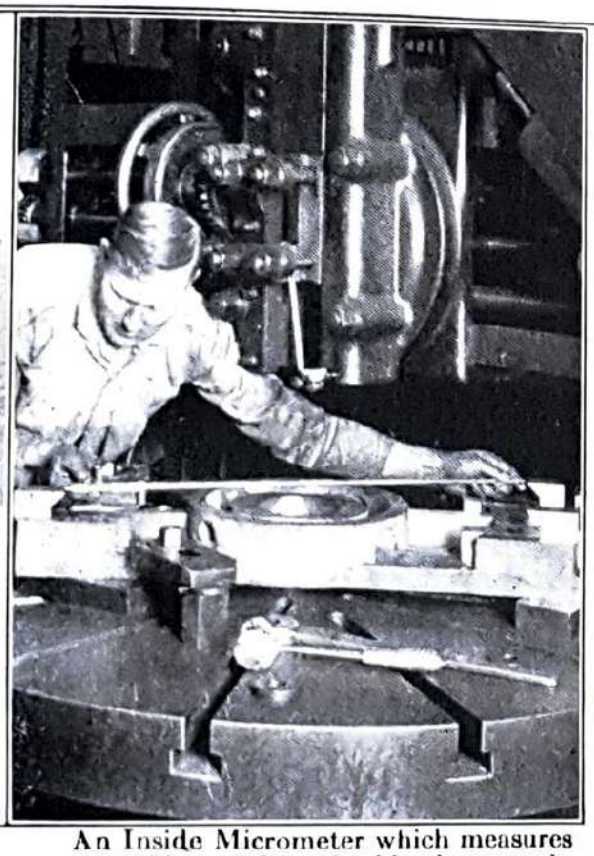
With this handle Inside Micrometers Nos. 263, 263M, 264, 264M, 265, 265M and small sizes from 2″ to 5″ of the Tubular Inside Micrometers No. 270 and corresponding sizes of No. 272 are made more convenient to use as they can be inserted in small holes for a greater distance than by the hand alone.

The hooked end of the handle fits snugly around the body of the micrometer and the brass plug which is forced against the micrometer clamps the handle tight without marring the tool. By simply turning the handle it is tightly locked in position and ready for use.

Each of the above packed one in a box.

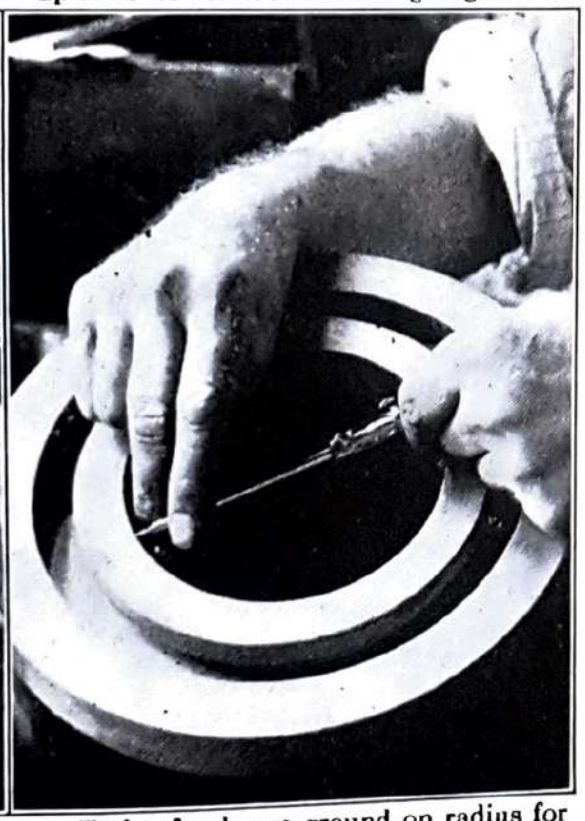


This Inside Micrometer No. 263 measures holes as small as 1″.

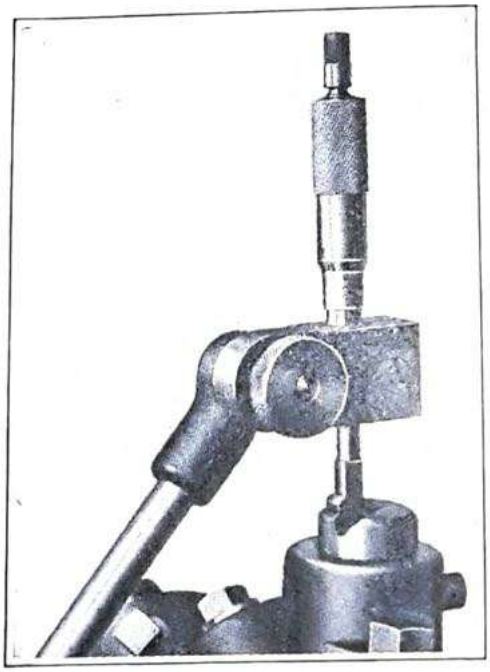


An Inside Micrometer which measures up to 36″ is useful for checking large work.

For quick accurate measurements, the Inside Micrometer finds many uses.



Ends of rods are ground on radius for measurement of rings, cylinders, etc.



Micrometer Heads

The Micrometer Heads listed below and on the following page are useful for fine measurements and adjustments. They are readily attached to special gages, fixtures, and machines.

The illustration shows a one inch head being used to set accurately a tool in a screw machine turret. It is held by a split clamp which is attached to the arm of a No. 730 Dial Indicator, which is fixed to the machine.

290
290 RS
291
291 RS

½″ Micrometer Heads Nos. 290 and 290RS

ENGLISH MEASURE or **METRIC MEASURE**

Measures by thousandths of an inch — **Measures by hundredths of a millimeter**

With or without Ratchet Stop

Price { **No. 290** / **No. 290RS,** Has Ratchet Stop } **$4.50**

Illustration shows tool with Ratchet Stop

Length of shank, 3-8″ or 9 mm. Spindle projects 9-16″ or 14.3 mm with micrometer set at zero. Diameter of shank, 3-8″ or 9 mm.

½″ Micrometer Heads Nos. 291 and 291RS

Measures by **ten-thousandths** as well as thousandths of an inch

With or without Ratchet Stop

Price { **No. 291** / **No. 291RS,** Has Ratchet Stop } **$6.25**

Similar to Nos. 290 and 290RS English Measure except that graduations read ten-thousandths as well as thousandths of an inch. Length of shank 3-8″. Spindle projects 9-16″ with micrometer set at zero. Diameter of shank, 3-8″.

Each of the above packed one in a box.

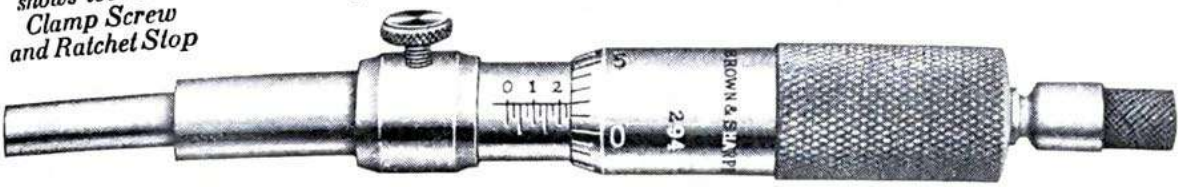
1″ Micrometer Heads Nos. 294 and 294RS

ENGLISH MEASURE Measures by thousandths of an inch **or** **METRIC MEASURE** Measures by hundredths of a millimeter

With or without Clamp Screw and with or without Ratchet Stop

Illustration shows tool with Clamp Screw and Ratchet Stop

Price { **294** / **294RS,** Has Ratchet Stop } **$5.50**



Length of shank 3-4″ or 21 mm. Spindle projects 1 1-16″ or 27 mm with micrometer set at zero. Diameter of shank 3-8″ or 9 mm. Furnished without clamp screw, unless otherwise ordered.

1″ Micrometer Heads Nos. 295 and 295RS

Measures by **ten-thousandths** as well as thousandths of an inch

With or without Ratchet Stop

Illustration shows tool with Ratchet Stop

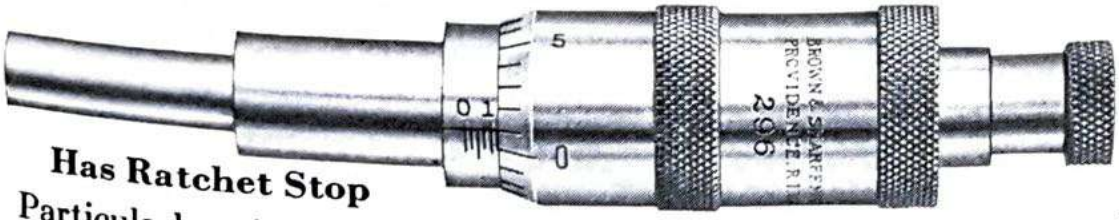
Price { **295** / **295RS,** Has Ratchet Stop } **$7.25**

Length of shank 3-4″. Spindle projects 1 1-16″ with micrometer set at zero. Diameter of shank 3-8″.

1″ Heavy Micrometer Head No. 296RS

Measures by thousandths of an inch

Price, $9.00



Has Ratchet Stop

Particularly suited for use with rugged machines and fixtures. Length of shank 13-16″. Spindle projects 1 1-8″ with micrometer set at zero. Diameter of shank 1-2″.

Each of the above packed one in a box.

294
294 RS
295
295 RS
296 RS

Standards of Lengths

The Standard Yard, first legalized in England in 1824, was destroyed in 1834. The Standard Imperial Yard, "Bronze No. 1", was then prepared and legalized in 1855. Forty copies were made and one of these, "Bronze No. 11", was presented to the United States by the British Government in 1856. At the same time another copy, known as "Low Moor Iron No. 57", was sent.

The use of the Meter as a Standard in the United States was legalized in 1866 and prototypes of the original Meter Bar were prepared in 1899; one of these, which was sent to Washington, is now being used as the basis of "Metric Measurements" in the United States.

We prepared Standards for use in our own shops, the mean errors of which were found to be for the Yard, .00002″, and for the meter, .000005M., both being too long. These Standards have been subdivided with the greatest care and accuracy, and our Rules are as nearly exact copies as expert mechanical skill, aided by machines especially designed for the purpose, can make them.

Our master line standards and master gage blocks are periodically checked at the Bureau of Standards and our measuring equipment and graduating machines are frequently calibrated and adjusted to these masters.

The Brown & Sharpe Mfg. Co. was among the first to manufacture steel rules in America and our complete line includes every style and size demanded by the mechanic. Rules are made of the highest quality steel and are machine graduated. They are especially easy to read accurately because of the uniform width and depth of the graduation lines.

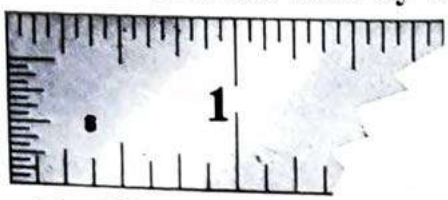
Graduations

Rules are divided into parts of an inch, as follows:

No. 1 Grad.	No. 2 Grad.	No. 3 Grad.	No. 4 Grad.	No. 7 Grad.
1st corner, 10, 20, 50, 100	8	10	8	16
2nd corner, 12, 24, 48	10, 20, 50, 100	50	16	32
3rd corner, 14, 28	12, 24, 48	32	32	64
4th corner, 16, 32, 64	16, 32, 64	64	64	100

No. 10 Graduation	No. 11 Graduation	No. 12 Graduation
1st corner, 32	64	50
2nd corner, 64	100	100

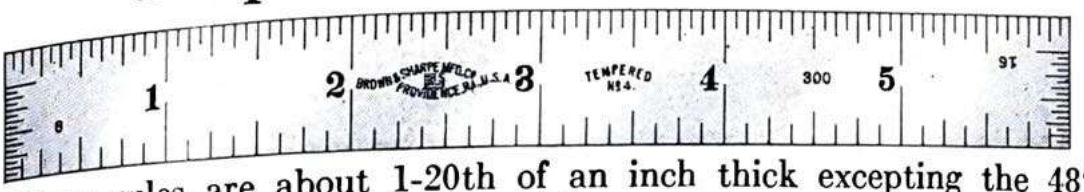
Metric Rules read by half-millimeters, millimeters or both.



End Graduations

Rules Nos. 300 and 315, 2″ to 12″ in length, and No. 320, 4″ to 12″ in length, with No. 4 Graduation have End Graduations reading to 32nds on two ends of one side. This feature is advantageous in measuring the depth and width of grooves, countersinks and recesses.

Tempered Steel Rules No. 300



These rules are about 1-20th of an inch thick excepting the 48″ which is about 1-10th of an inch thick.

No.	Length, Inches	Approx. Width, In.	Number of Graduation	Price	Length, Inches	Approx. Width, In.	Number of Graduation	Price
300	1	29-64	4	$0.30	12	31-32	1, 2, 4 or 7	$1.65
	2	1-2	4 or 7	.45	18	31-32	4 or 7	2.60
	3	35-64	4 or 7	.60	24	31-32	4 or 7	3.25
	4	19-32	4 or 7	.75	36	31-32	4 or 7	7.00
	6	11-16	1, 2, 4 or 7	.90	*48	1 1-2	4 or 7	10.00
	9	53-64	4 or 7	1.35				

*Not tempered. For Graduation Numbers, see page opposite.

Tempered Steel Rules No. 301

METRIC MEASURE

These rules are about 1½ mm thick. First corner graduated in ½ mm and remaining three corners in mm.

No.	Length, cm	Approximate Width, mm	Price	Length, cm	Approximate Width, mm	Price
301	10	15	$0.75	30	25	$1.65
	15	17	.90	50	25	2.60
	20	21	1.20			

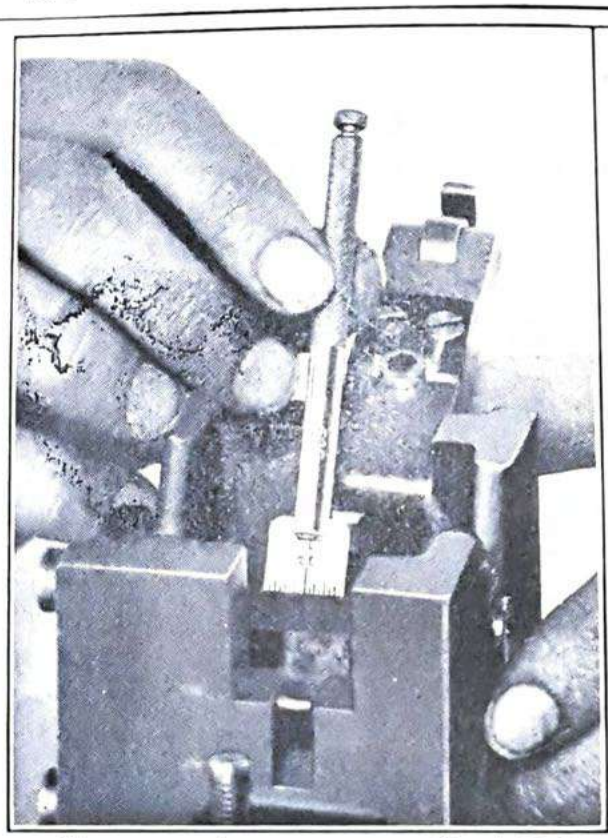
Tempered Steel Rules No. 302

ENGLISH AND METRIC MEASURE

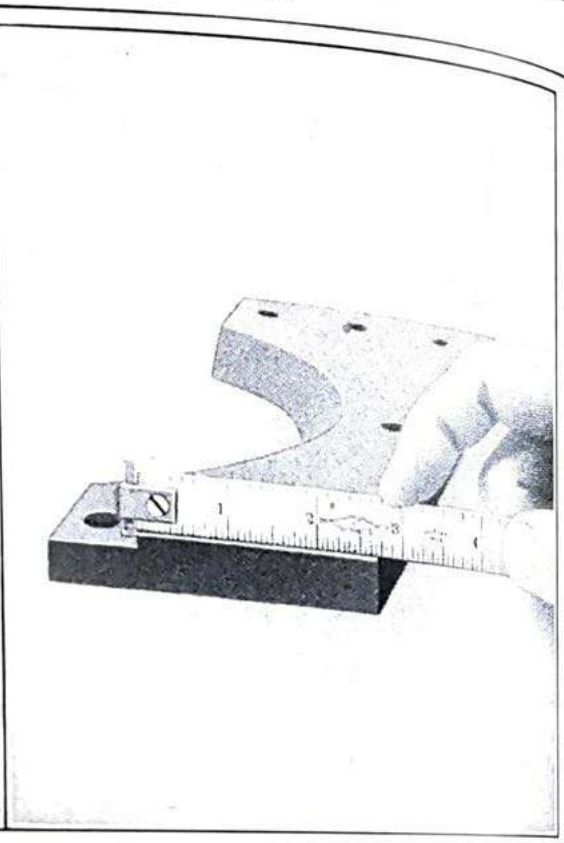
These rules are about 1½ mm or about 1-20th of an inch thick.

No.	Length, cm	Length of English Graduations, Inches	Approximate Width		Graduations	Price
			Inches	mm		
302	10	3 7-8 in 64ths 3 9-10 in 100ths	19-32	15	1st corner: 64ths 2nd corner: mm 3rd corner: 100ths 4th corner: ½ mm	$0.75
	15	5 7-8 in 64ths 5 8-10 in 100ths	11-16	17		.90
	20	7 3-4 in 64ths 7 8-10 in 100ths	13-16	21	1st corner: 64ths for 2″, 16ths for remainder of length 2nd corner: mm 3rd cor: 100ths for 2″, 50ths for remainder of length 4th corner: ½ mm	1.20
	30	11 5-8 in 64ths 11 7-10 in 100ths	31-32	25		1.65
	50	19 1-2 in 64ths 19 6-10 in 100ths	31-32	25		2.60

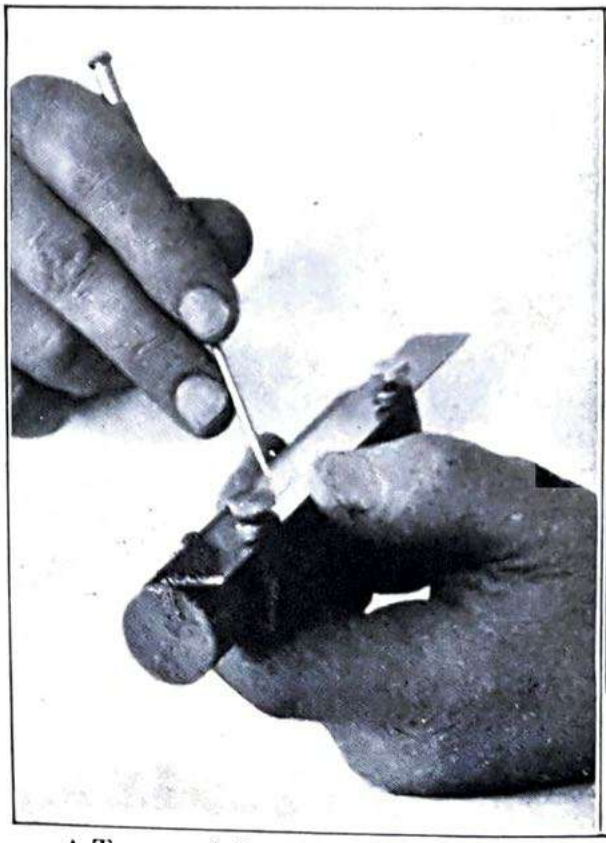
Each of the above packed six in a box, except 18″ to 48″ (and 50 cm) which are packed one in a package.



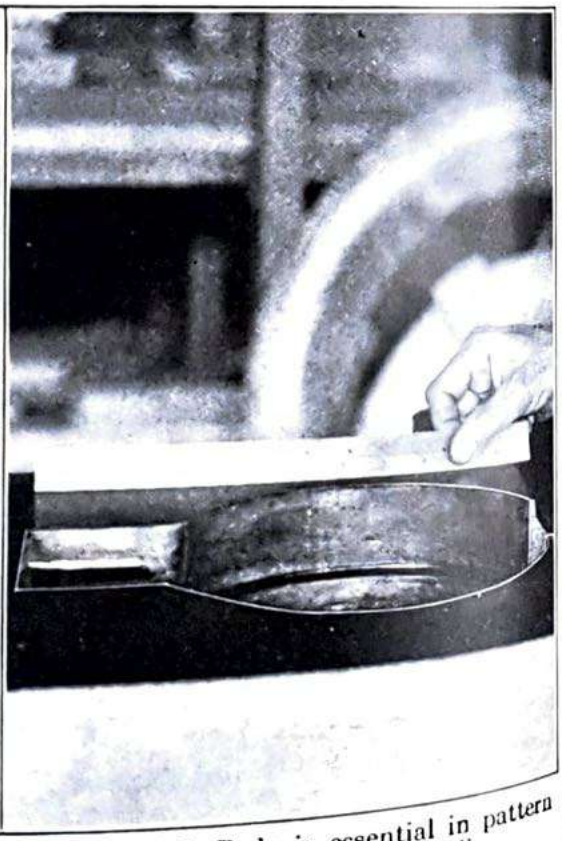
For measuring recesses, a Steel Rule with Holder is often very convenient.



A Brown & Sharpe Hook Rule measures work with a very shallow shoulder.

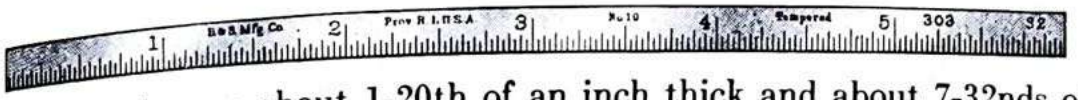


A Tempered Steel Rule used with Keyseat Clamps assures a correct layout.



A Shrink Rule is essential in pattern work in allowing for "shrinkage".

Narrow Tempered Steel Rules No. 303



These rules are about 1-20th of an inch thick and about 7-32nds of an inch wide. Graduated on one corner of each side only.

No.	Length, Inches	*Number of Graduation	Price
303	4	10	$0.75
	6	10 or 11	.90
	9	10	1.35
	12	10	1.65

*No. 10, 32nds and 64ths; No. 11, 64ths and 100ths.

Narrow Tempered Steel Rules No. 304

METRIC MEASURE

These rules are about 1 1-2 mm thick and about 5 1-2 mm wide. Graduated on one corner of each side only.

No.	Length, Centimeters	Graduations	Price
304	10	1st corner: ½ mm 2nd corner: mm	$0.75
	15		.90
	20		1.20
	30		1.65

Narrow Tempered Steel Rules No. 305

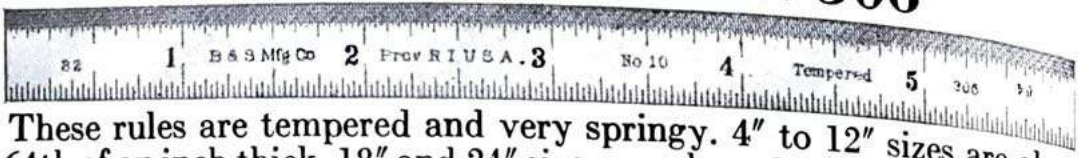
ENGLISH AND METRIC MEASURE

These rules are about 1-20 of an inch thick and 7-32 of an inch wide or about 1 1-2 mm thick and 5 1-2 mm wide. Graduated on one corner of each side only.

No.	Length, Centimeters	Length of English Graduation, Inches	Graduations	Price
305	10	3 7-8 in 64ths	1st corner: 64ths 2nd corner: ½ mm	$0.75
	15	5 7-8 in 64ths		.90
	20	7 13-16 in 64ths		1.20
	30	11 3-4 in 64ths		1.65

Each of the above packed six in a box.

Flexible Steel Rules No. 306



These rules are tempered and very springy. 4″ to 12″ sizes are about 1-64th of an inch thick. 18″ and 24″ sizes are about 1-32″ thick. Graduated on both corners of one side only.

306

No.	Length, Inches	Approx. Width, In.	Number of Graduation	Price	Length, Inches	Approx. Width, In.	Number of Graduation	Price
306	4	1-2	10	$0.75	12	1-2	10, 11 or 12	$1.65
	6	1-2	10, 11 or 12	.90	18	3-4	10	2.60
	9	1-2	10	1.35	24	3-4	10	3.25

306 A

For Graduation Numbers, see page 296. Leather Case for 6″ Rule $0.15 extra.

307

Flexible Steel Rule No. 306A

308

With Figured Graduations. **Price, 90 cents.**

6″ length only, with No. 10 graduation, 32nds and 64ths. Has figured graduations. The 32nds are numbered every 4th graduation and the 64ths every 8th graduation as shown at left. Rule is approximately 1-2″ wide, and 1-64″ thick. Leather case, 15 cents extra.

Flexible Steel Rules No. 307

METRIC MEASURE

These rules are about ½ mm thick and about 13 mm wide. Graduated on both corners of one side only. Leather case for 15 cm rule, 15 cents extra.

No.	Length, Centimeters	Graduations	Price
307	10	1st corner: ½ mm	$0.75
	15	2nd corner: mm	.90
	30		1.65

Flexible Steel Rules No. 308

ENGLISH AND METRIC MEASURE

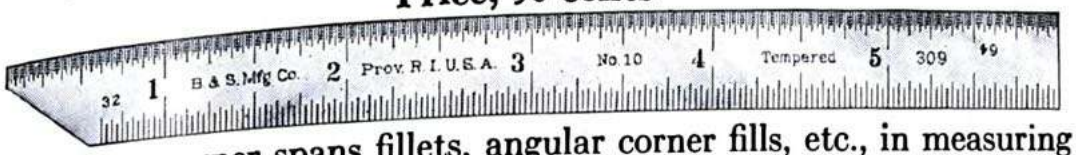
These rules are about 1-64th of an inch thick and ½ of an inch wide or about ½ mm thick and about 13 mm wide. Graduated on both corners of one side only. Leather Case for 15 cm rule, 15 cents extra.

No.	Length, Centimeters	Length of English Graduations, Inches	Graduations	Price
308	10	3 7-8 in 64ths	1st corner: 64ths	$0.75
	15	5 3-4 in 64ths	2nd corner: ½ mm	.90
	30	11 3-4 in 64ths		1.65

Each of the above packed six in a box, except 18″ and 24″ which are packed one in a package.

6″ Flexible Steel Fillet Rule No. 309

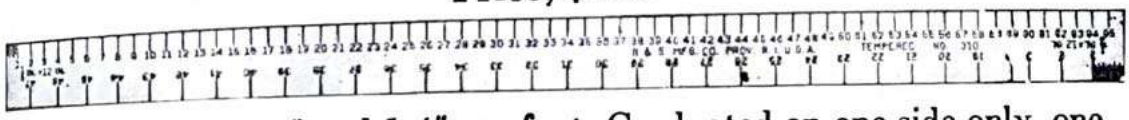
Price, 90 cents



Cut away corner spans fillets, angular corner fills, etc., in measuring flanges, shoulders and distances on similar intersecting surfaces. Tempered and very springy. Made in 6″ length only with No. 10 graduation, 32nds and 64ths. Graduated on one side only. ½″ wide and 1/64″ thick (approx.). 309

Modelmakers' 12″ Flexible Steel Rule No. 310 310

Price, $2.00 315

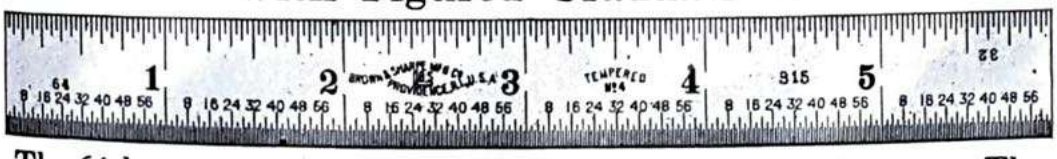


Has scales of 1-8″ and 1-4″ per foot. Graduated on one side only, one edge in 8ths of an inch; one edge in 4ths. Both 8ths and 4ths are numbered consecutively. The first 8th and first 4th graduations, on opposite corners, are subdivided into 48ths of an inch to scale 2″ and 1″, respectively. Rule is approximately ½″ wide, and 1-64″ thick. Made in 12″ length only.

The flexible feature facilitates measurement over contours, forms etc.

Tempered Steel Rules No. 315

With Figured Graduations



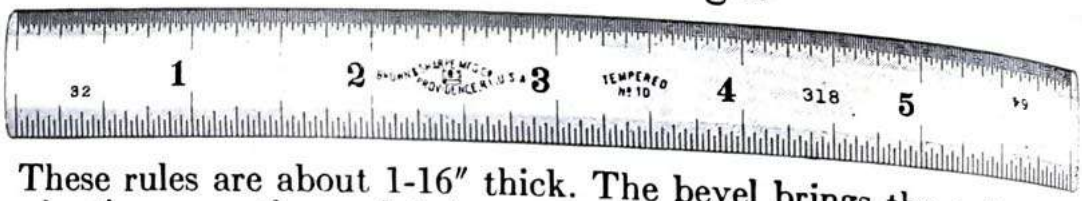
The 64ths are numbered every 8th graduation, as 8, 16, 24, etc. These rules are about 1-20th of an inch thick. The 6″ size with No. 3 graduation facilitates measurement where dimensions are in decimals. Each 1-10″ in the 50th graduations, and each eight 64th graduations are figured. Hundredths of an inch are estimated readily. Especially useful for many classes of present day shop work.

No.	Length, Inches	Approx. Width, In.	*Number of Graduation	Price	Length, Inches	Approx. Width, In.	*Number of Graduation	Price
315	1	29-64	4	$0.30	9	53-64	4	$1.35
	2	1-2	4	.45	12	31-32	4	1.65
	3	35-64	4	.60	18	1	4	2.60
	4	19-32	4	.75	24	1	4	3.25
	6	11-16	3 and 4	.90				

*No. 3, 10ths, 50ths, 32nds & 64ths; No. 4, 8ths, 16ths, 32nds & 64ths.

Each of the above packed six in a box, except 18″ and 24″ which are packed one in a package.

Tempered Steel Rules No. 318
With Beveled Edges



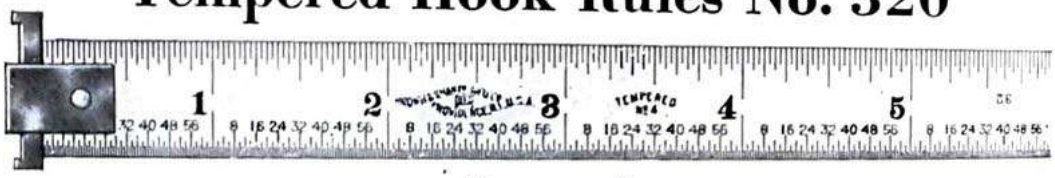
318 These rules are about 1-16″ thick. The bevel brings the ends of the graduations near the work being measured and aids in the taking of accurate measurements. 6″ rule is furnished in leather case.

320

No.	Length, Inches	Approx. Width, Inches	*Number of Graduation	Price
318	6	11-16	10 or 11	$1.20
	12	1	10 or 11	1.80
	24	1	10 or 11	4.80

*No. 10, 32nds, and 64ths; No. 11, 64ths and 100ths.
6″ Rule packed six in a box. 12″ and 24″ Rules one in a box.

Tempered Hook Rules No. 320



Patented

These are tempered rules with a sliding hook which makes possible accurate measurements against shallow shoulders. They are also very convenient in taking measurements of flanges or circular pieces or through the hubs of pulleys: Also for setting calipers and dividers and taking measurements from points where the user cannot see if the rule is even with the measuring edge.

These rules with the exception of the 36″ size are regularly furnished with figured graduations. The 4″ to 12″ sizes are furnished with end graduations. The thickness of these rules is about 1-20th of an inch.

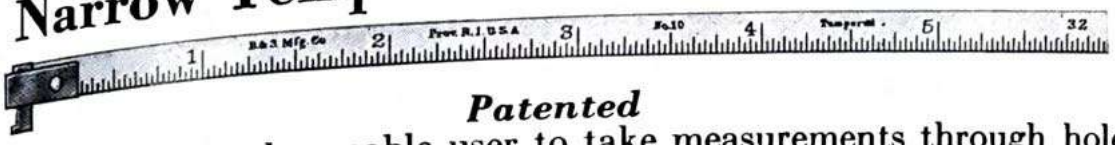
No.	Length, Inches	Approx. Width, In.	*Number of Graduation	Price	Length, Inches	Approx. Width, In.	*Number of Graduation	Price
320	4	19-32	4	$1.10	18	1	4	$3.10
	6	11-16	4	1.25	24	1	4	3.75
	9	53-64	4	1.75	36	1	4	7.65
	12	31-32	4	2.15				

*No. 4, 8ths, 16ths, 32nds and 64ths.

Furnished in Metric Measure in 10 cm, 15 cm, 20 cm, 30 cm and 50 cm sizes at prices for corresponding English Measure sizes above. Also furnished in 60 cm and 90 cm sizes; prices on application.

Packed six in a box except 18″, 24″ and 36″, which are packed one in a package.

Narrow Tempered Hook Rules No. 325



Patented

These narrow rules enable user to take measurements through holes as small as 3-8″ in diameter. They are about 1-20th of an inch thick.

No.	Length, Inches	Approx. Width, In.	*Number of Graduation	Price	Length, Inches	Approx. Width, In.	*Number of Graduation	Price
325	4	7-32	10	$1.00	9	7-32	10	$1.65
	6	7-32	10	1.20	12	7-32	10	2.00

325

335

*No. 10, 32nds and 64ths.

No. 325 Hook Rules are furnished with metric graduations when ordered. Prices as listed above. Packed six in a box, except 18″, 24″, and 36″, which are packed one in a package.

Steel Rules with Holder No. 335

ENGLISH MEASURE or METRIC MEASURE

Lengths, 1-4, 3-8, 1-2, 3-4, and 1″ Lengths, 5, 10, 15, 20, and 25 mm

5 Rules Interchangeable in One Holder

Price, complete, $2.50

Convenient where ordinary rule cannot be used as in measuring a recess or keyway and for general tool and die work.

Rules are held in a split chuck adjusted by knurled nut at the top of holder and can be set at various angles.

The rules are of tempered steel, graduated on both sides. Graduations No. 10—32nds and 64ths; No. 12—50ths and 100ths.

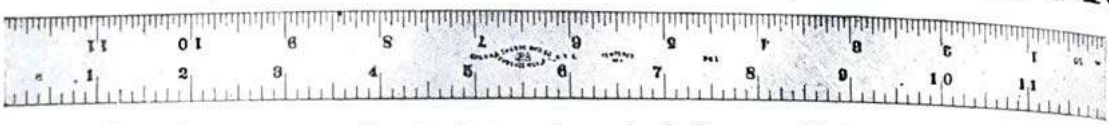
Rules for No. 335

English		Metric		Price of Rules
Length, Inches	No. of Grad.	Length, mm	Metric Grad.	
1-4	10	5	mm and ½ mm	$0.35
3-8	10	10		.35
1-2	10 or 12	15		.35
3-4	10	20		.35
1	10 or 12	25		.35

Holder, Price, $0.75

Packed, complete, one set in a box.

Tempered Steel Shrink Rules
Nos. 340, 341, 342, 343, 344, 345 and 346



340 to 346

Shrink rules are graduated to give shrinkage allowances directly.

No.	Shrink per Foot	Length, Inches	Width, Inches	*Number of Graduation	Price
340	1-10	6 1-20	11-16	4	$1.00
	1-10	12 1-10	31-32	4	2.10
	1-10	24 1-5	31-32	4	4.25
341	1-8	6 1-16	11-16	4	1.00
	1-8	12 1-8	31-32	4	2.10
	1-8	24 1-4	31-32	4	4.25
342	3-16	12 3-16	31-32	4	2.10
	3-16	24 3-8	31-32	4	4.25
343	1-4	6 1-8	11-16	4	1.00
	1-4	12 1-4	31-32	4	2.10
	1-4	24 1-2	31-32	4	4.25
344	5-16	12 5-16	31-32	4	2.10
	5-16	24 5-8	31-32	4	4.25
345	5-32	12 5-32	31-32	4	2.10
	5-32	24 5-16	31-32	4	4.25
346	3-8	12 3-8	31-32	4	2.10
	3-8	24 3-4	31-32	4	4.25

*No. 4, 8ths, 16ths, 32nds and 64ths.
6″ and 12″ Rules packed six in a box; 24″ Rules, one in a package.

SHRINKAGE OF CASTINGS

The allowance necessary for shrinkage varies for different kinds of metal, and the different conditions under which they are cast. For castings where the thickness runs fairly uniform, cast under ordinary conditions, the following allowance can be made:

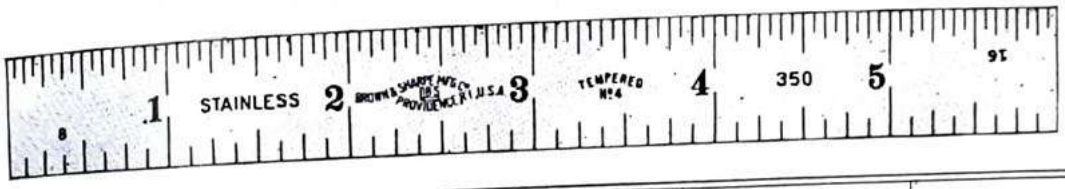
For Cast Iron,	1-8″ per ft.	For Zinc,	5-16″ per ft.
" Brass,	3-16″ " "	" Tin,	1-12″ " "
" Steel,	1-4″ " "	" Aluminum,	3-16″ " "
" Malleable Iron,	1-8″ " "	" Britannia,	1-32″ " "

The above table gives the standard shrinkage of different metals, but some consideration must be given to the size and shape of the casting. Thick castings will shrink less, under the same conditions, and thinner ones more than the standard. The quality of the material and the manner of molding and cooling will also make a difference in shrinkages.

Stainless Steel Rules

These rules are made from stainless steel. They are rust-proof, will not stain or discolor and will always retain their bright finish. They are particularly useful where exposed to salt air or acid fumes and in the tropics.

Stainless Steel Rules No. 350 350
Tempered 356



No.	Length, Inches	Width, Inches	*Number of Graduation	Price
350	6	11-16	4	$1.35
	12	31-32	4	2.65

*No. 4, 8ths, 16ths, 32nds and 64ths.

Flexible Stainless Steel Rule No. 356
Tempered

This rule is both stainless and flexible. Mechanics find in it all the fine qualities they desire in a pocket rule. It is easy to read and will remain permanently bright. Stainless steel does not have the lively spring temper of straight carbon steel and will not withstand sharp bends, but this rule is sufficiently flexible for all reasonable requirements. Leather Case, 15 cents extra.

No.	Length, Inches	Width, Inches	*Number of Graduation	Price
356	6	½	10	$1.35

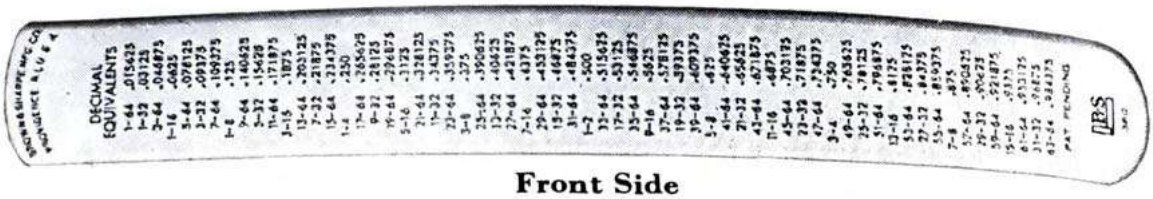
*No. 10, 32nds and 64ths.

Each of the above packed six in a box.

Pocket Saving Rule Case No. 360

Price, 60 cents

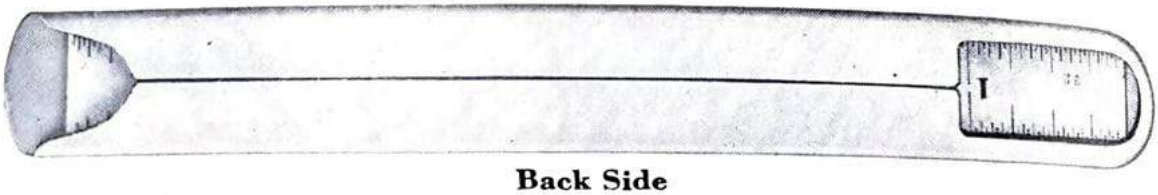
360



Front Side

374

377



Back Side

Prevents the pocket from becoming worn and torn by rule corners. Has decimal equivalents on front side. Made of dull finish aluminum with rounded corners. For Nos. 300, 315, and 350, 6″ rules, and similar rules of other makes.

Key Seat Rules No. 374

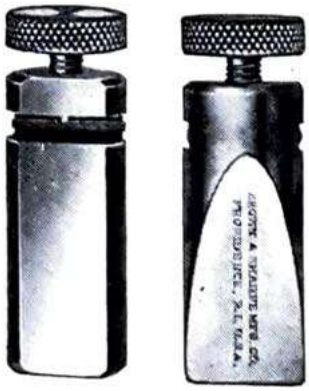
Parallel lines for key seats, mortises etc., can be accurately drawn on shafts not less than 7-8″ in diameter with these rules. Edges are beveled. Graduated to 32nds of an inch on both corners of one side.

No.	Length, In.	Price	Length, In.	Price	Length, In.	Price
374	4	$3.00	6	$3.60	8	$4.50

Each of the above packed six in a box.

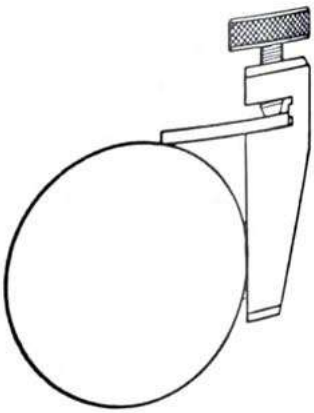
Key Seat Clamps No. 377

Price, 75 cents per pair



Easily put on and taken off steel rules for laying out keyways and scribing parallel lines on circular pieces. Can also be used on combination square blades and straight edges (except Beveled Steel Straight Edges).

Packed one pair in a box, 6 boxes in a carton.



6-Inch Rule with Slide No. 380

ENGLISH MEASURE or METRIC MEASURE

Price, $2.00

380

385

The slide enables the user to take a series of accurate measurements against shoulders or flanges. The slide may be used on either side of the rule or may be removed and the rule used alone.

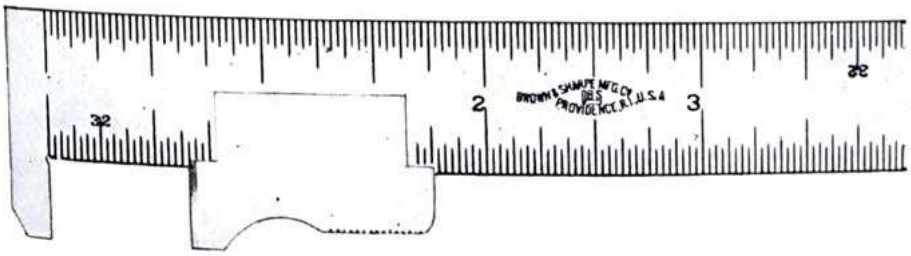
English Measure rules are 6″ long, 5-8″ wide, and 1-16″ thick, with No. 4 Graduation, 8ths, 16ths, 32nds and 64ths.

Metric Measure rules are 15 cm long, 15 mm wide, and 1 1-2 mm thick. They are graduated on three corners in millimeters and one corner in half millimeters.

Slide Caliper Rule No. 385

ENGLISH MEASURE or METRIC MEASURE

Price, $2.50



For measuring small rods, tubing, sheet stock etc., this tool is very desirable, as the slide enables the user to get quick measurements.

English Measure rules are 4 3-16″ long, 11-16″ wide, and about 1-16″ thick, graduated on both corners in 32nds of an inch. The jaws are about 3-8″ deep.

Metric Measure rules are 10 cm long, 17 mm wide, and 1 1-2 mm thick. They are graduated on one side only in half millimeters on both corners. The jaws are about 9 1-2 mm deep.

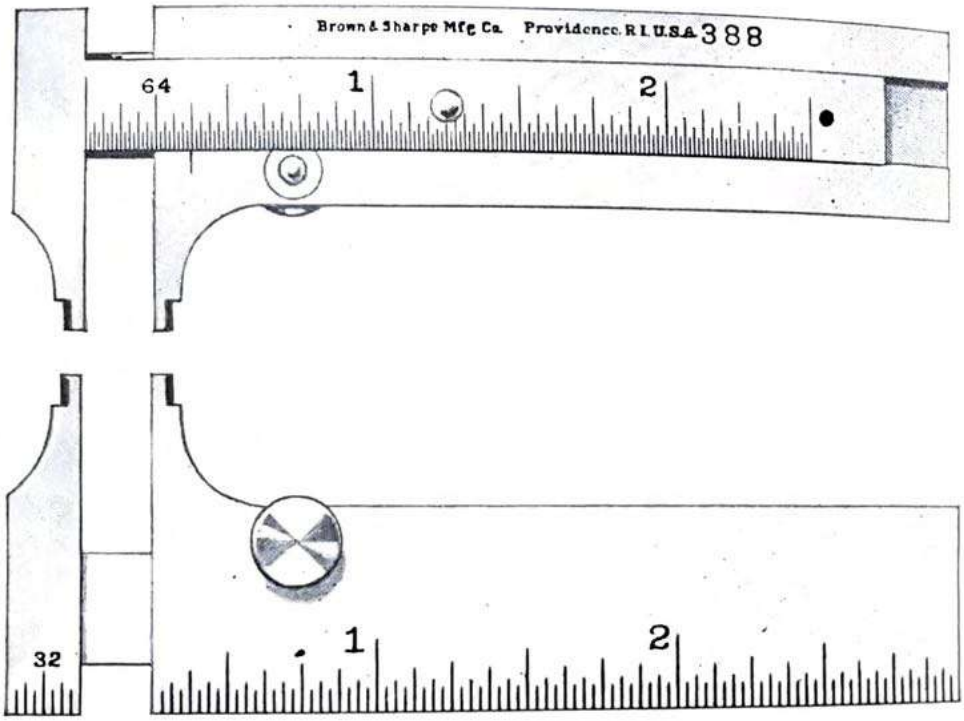
Each of the above packed six in a box.

Pocket Slide Caliper Rule No. 388

ENGLISH MEASURE or METRIC MEASURE

Price, $4.00

388



These rules accurately measure inside and outside diameters. The nibs of the jaws can be inserted in holes as small as 1-8 of an inch or 3 mm in diameter.

The clamp nut locks the slide and holds it set for any particular measurement. The button on the slide aids in opening and closing the jaws.

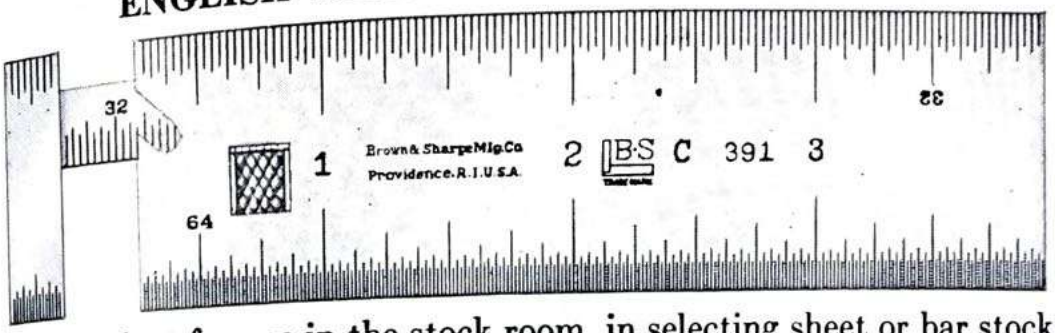
English Measure rules are 3″ long, 11-16″ wide, and about 1-8″ thick. One corner is graduated in 32nds and the slide in 64ths for 2 1-2″. The jaws are 5-8″ long, and, when open, measure up to 2″.

Metric Measure rules are 75 mm long, 17 mm wide, and about 3 mm thick. One corner is graduated in mm and the slide is ½ mm. The jaws are about 15 mm long and measure up to 50 mm.

Packed six in a box.

Steel Caliper Rules No. 391

ENGLISH MEASURE or METRIC MEASURE



391

391 A

Convenient for use in the stock room, in selecting sheet or bar stock, wire, tubing, etc.

English Measure. The slide of the 3″ rule can be drawn out to measure 2 1-4″, and the slide of the 4″ to measure 3 1-4″.

Metric Measure. The slide of the 75 mm rule can be drawn out to measure 50 mm, and the slide of the 100 mm to measure 75 mm.

No.	Length, English	Length, Metric	Graduations				Price
			Corner	English C	English D	Metric	
391	3″	75 mm	1st	8	8	mm and 1-2 mm	$5.00
			2nd	16	16		
			3rd	32	32		
	4″	100 mm	4th	64	64	mm and 1-2 mm	6.50
			slide	32-64	64-100		

In ordering state whether style C or D graduation is desired.
Furnished nickel plated when desired. Prices on application.

Stainless Caliper Rule No. 391A

Price, $5.50

The stainless feature provides a lasting fine finish and clean, easily read graduations.

Made only in 3″ length and graduated with 1st corner in 8ths; 2nd corner in 16ths; 3rd corner in 32nds; 4th corner in 64ths; and the slide in 32nds and 64ths of an inch.

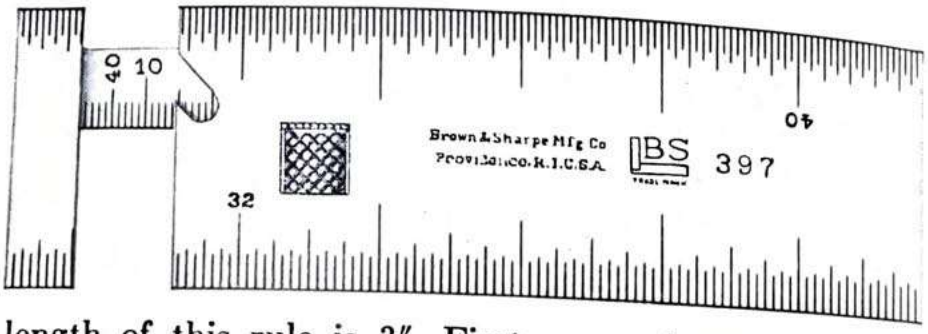
Each of the above packed six in a box.

Button Rule No. 397

Price, $5.00

397

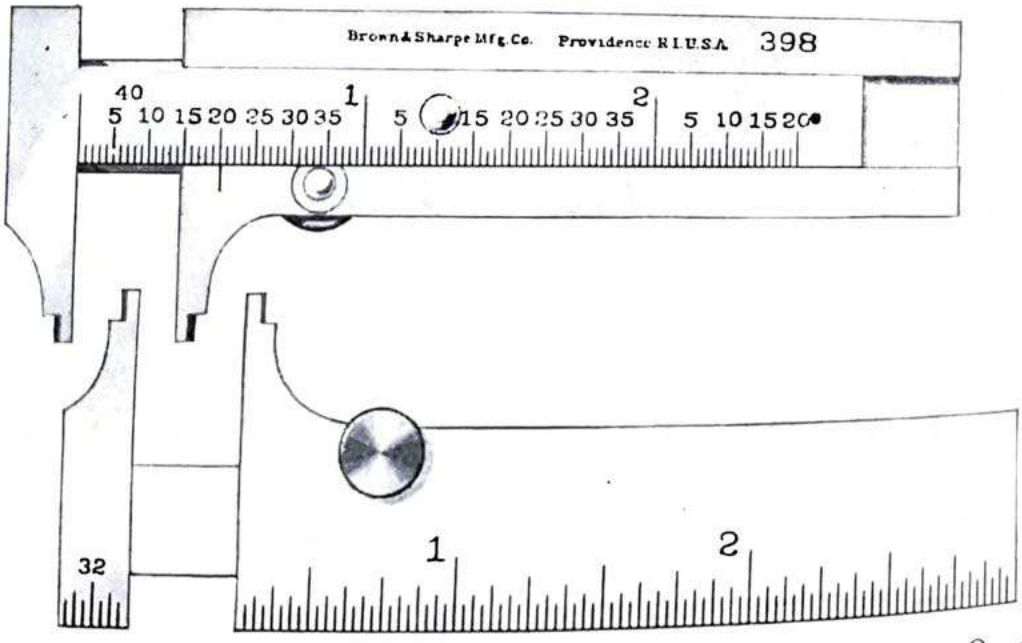
398



The length of this rule is 3″. First corner is graduated in 16ths, second corner in 20ths, third corner in 32nds, fourth corner in 40ths of an inch, and the slide in 40ths and 80ths of an inch.

Pocket Button Rule No. 398

Price, $4.00



This Pocket Button Rule is exceptionally convenient to use. On one side it is graduated in 32nds of an inch and can be used as an ordinary rule. The other side is used as a button rule, the graduations on the slide reading to 40ths of an inch. It has a range of 2″ and both external and internal measurements can be made.

The clamp nut locks the slide and holds it set for any particular measurement. The button on the slide aids in opening and closing the jaws.

Each of the above packed six in a box.

Combination Squares, Combination Sets and Protractors Nos. 400 to 460

BROWN & SHARPE Combination Squares and Sets are accurately made and adaptable to a great many uses. The unhardened heads are of cast iron. The hardened heads are drop forged and are light, durable and convenient. The revolving turrets in the protractors are accurately fitted and graduated to 90 degrees either side of zero. They can be set accurately at any angle and rigidly clamped by a thumb nut.

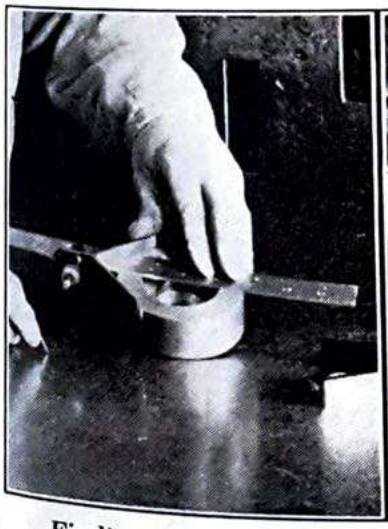
The reversible bolt is an exclusive and very convenient Brown & Sharpe feature and is patented. It permits either side of the blade to be used, as desired. The knurled tip on the bolt permits the bolt to be reversed without removing it from the head.

The round clamping groove allows the blades to be quickly inserted in the heads. The bolt forces the blade against the bottom of the slot, square with the face of the head, and the blade groove presents no sharp corners to collect dirt and interfere with the accuracy of the tool.

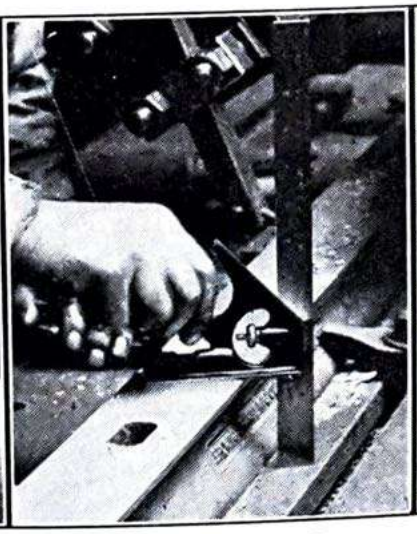
The levels, which are furnished with all but the four-inch sets, are accurately set.

The square heads have wide surfaces and, together with the blade, make excellent try squares. With the blade, the square heads can be used as depth or height gages. The accuracy of the 45-degree angle can be relied on—it is made correctly. The ends of the center heads are ground on a radius and can be used on work of large diameter.

The blades are tempered and graduated with the same care and accuracy as our steel rules. All parts of the same size are interchangeable.



Finding center line of round work is one use for Combination Squares.



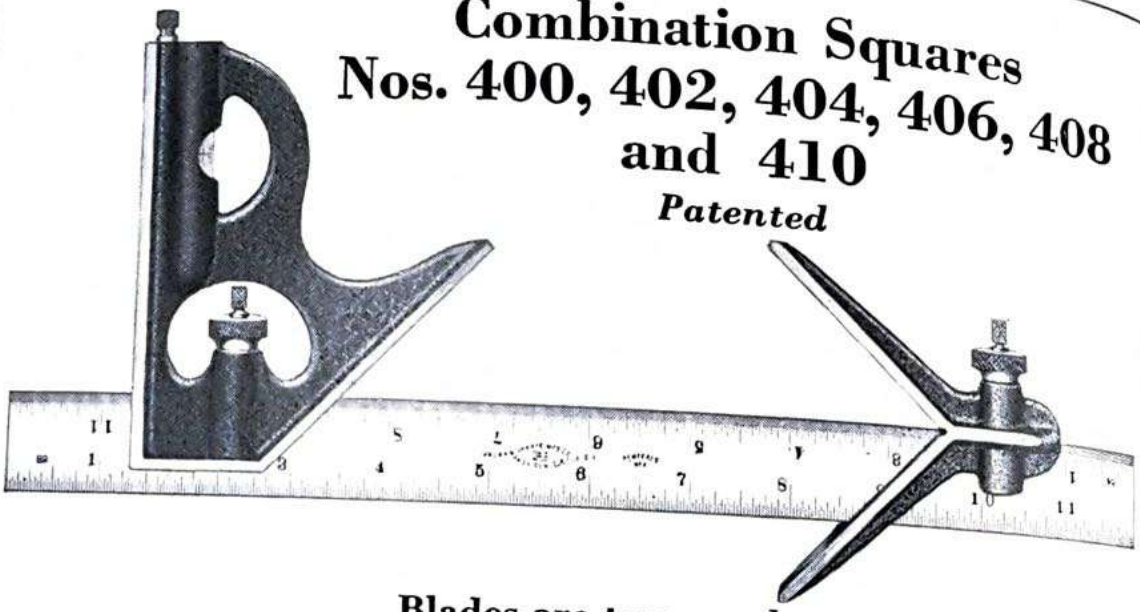
A Combination Square makes a very convenient depth gage.

Angles are determined quickly and accurately with a Protractor.

Combination Squares Nos. 400, 402, 404, 406, 408 and 410

Patented

400
402
404
406
408
410



Blades are tempered

With Heads Hardened			With Heads not Hardened		
No.	Size	Price	No.	Size	Price
400 English	6 inch	**$4.60**	**402 English**	6 inch	$2.40
	9 "	**5.30**		9 "	3.00
	12 "	**6.20**		12 "	3.60
	18 "	**7.30**		18 "	4.50
	24 "	**8.20**		24 "	5.40
404 Metric	15 cm	**4.60**	**406 Metric**	15 cm	2.40
	20 "	**5.30**		20 "	3.00
	30 "	**6.20**		30 "	3.60
	50 "	**7.30**		50 "	4.50
	60 "	**8.20**		60 "	5.40
408 English and Metric	15 cm	**4.60**	**410 English and Metric**	15 cm	2.40
	20 "	**5.30**		20 "	3.00
	30 "	**6.20**		30 "	3.60
	50 "	**7.30**		50 "	4.50
	60 "	**8.20**		60 "	5.40

GRADUATIONS

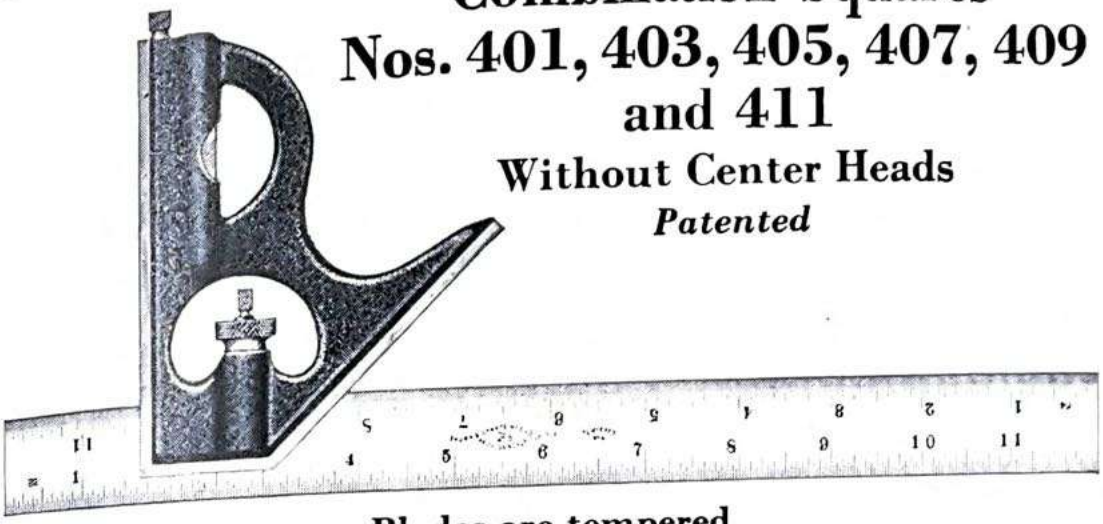
Nos. 400 and 402—No. 4 or No. 7*			Nos. 404 and 406	Nos. 408 and 410
1st Corner	8	16	1st and 3rd corners: mm	1st corner: mm
2nd Corner	16	32	2nd and 4th corners: 1-2 mm	2nd corner: 32nds″
3rd Corner	32	64		3rd corner: 1-2 mm
4th Corner	64	100		4th corner: 64ths″

*No. 7 Graduation not furnished on 18″ and 24″ Squares.
Packed one in a box.

Combination Squares Nos. 401, 403, 405, 407, 409 and 411

Without Center Heads

Patented



401

403

405

407

409

411

Blades are tempered

With Heads Hardened			With Heads not Hardened		
No.	Size	Price	No.	Size	Price
401 English	4 inch	$2.30	403 English	4 inch	$1.50
	6 "	3.10		6 "	1.80
	9 "	3.40		9 "	2.40
	12 "	4.30		12 "	3.00
	18 "	5.40		18 "	3.90
	24 "	6.30		24 "	4.80
405 Metric	10 cm	2.30	407 Metric	10 cm	1.50
	15 "	3.10		15 "	1.80
	20 "	3.40		20 "	2.40
	30 "	4.30		30 "	3.00
	50 "	5.40		50 "	3.90
	60 "	6.30		60 "	4.80
409 English and Metric	15 cm	3.10	411 English and Metric	15 cm	1.80
	20 "	3.40		20 "	2.40
	30 "	4.30		30 "	3.00
	50 "	5.40		50 "	3.90
	60 "	6.30		60 "	4.80

GRADUATIONS

Nos. 401 and 403—No. 4 or No. 7*			Nos. 405 and 407	Nos. 409 and 411
1st Corner	8	16	1st and 3rd corners: mm	1st corner: mm
2nd Corner	16	32	2nd and 4th corners: 1-2 mm	2nd corner: 32nds″
3rd Corner	32	64		3rd corner: 1-2 mm
4th Corner	64	100		4th corner: 64ths″

*No. 7 Graduation not furnished on 4″, 18″ and 24″ Squares.

Packed one in a box.

Combination Squares Nos. 412 and 420

Heavy

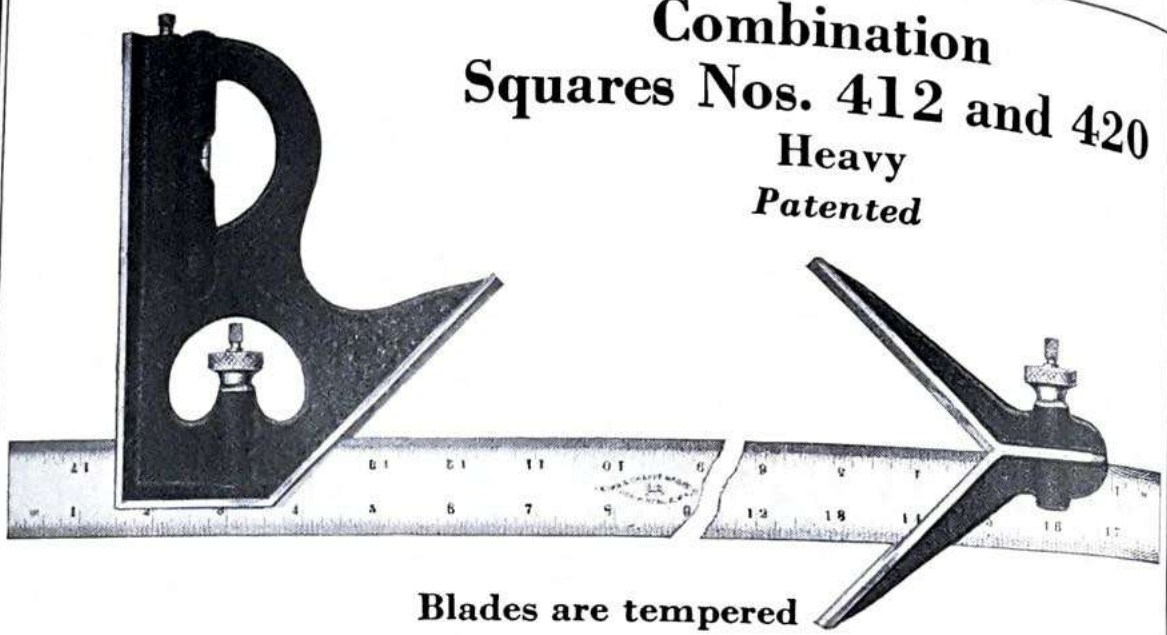
Patented

412

413

420

421



Blades are tempered

With Heads Hardened

No.	Size	Price	No.	Size	Price
412 English	18 inch 24 "	**$9.60** **11.10**	**420 English and Metric**	50 cm 60 "	$9.60 11.10

Combination Squares Nos. 413 and 421

Heavy

Without Center Heads

Patented

Blades are tempered

With Heads Hardened

No.	Size	Price	No.	Size	Price
413 English	18 inch 24 "	**$7.20** **8.70**	**421 English and Metric**	50 cm 60 "	$7.20 8.70

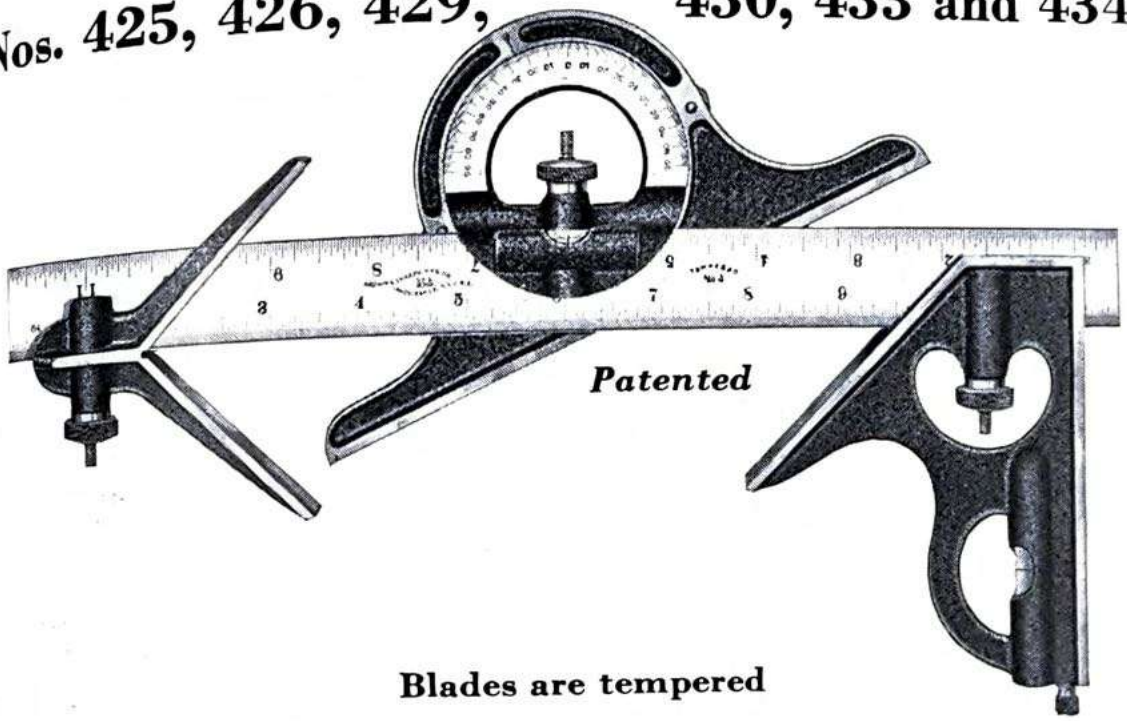
GRADUATIONS

Nos. 412 and 413—No. 4 Graduation		Nos. 420 and 421
1st Corner	8	1st corner: mm
2nd Corner	16	2nd corner: 32nds"
3rd Corner	32	3rd corner: 1-2 mm
4th Corner	64	4th corner: 64ths"

Packed one in a box.

Combination Sets

Nos. 425, 426, 429, 430, 433 and 434



425
426
429
430
433
434

Blades are tempered

With Square and Center Heads Hardened			With Square and Center Heads Not Hardened		
No.	Size	Price	No.	Size	Price
425 English	9 inch	$8.30	426 English	9 inch	$6.00
	12 "	9.20		12 "	6.60
	18 "	10.30		18 "	7.50
	24 "	11.20		24 "	8.40
429 Metric	20 cm	8.30	430 Metric	20 cm	6.00
	30 "	9.20		30 "	6.60
	50 "	10.30		50 "	7.50
	60 "	11.20		60 "	8.40
433 English and Metric	20 cm	8.30	434 English and Metric	20 cm	6.00
	30 "	9.20		30 "	6.60
	50 "	10.30		50 "	7.50
	60 "	11.20		60 "	8.40

GRADUATIONS

Nos. 425 and 426—No. 4 or No. 7*			Nos. 429 and 430	Nos. 433 and 434
1st Corner	8	16	1st and 3rd corners: mm	1st corner: mm
2nd Corner	16	32	2nd and 4th corners: 1-2 mm	2nd corner: 32nds″
3rd Corner	32	64		3rd corner: 1-2 mm
4th Corner	64	100		4th corner: 64ths″

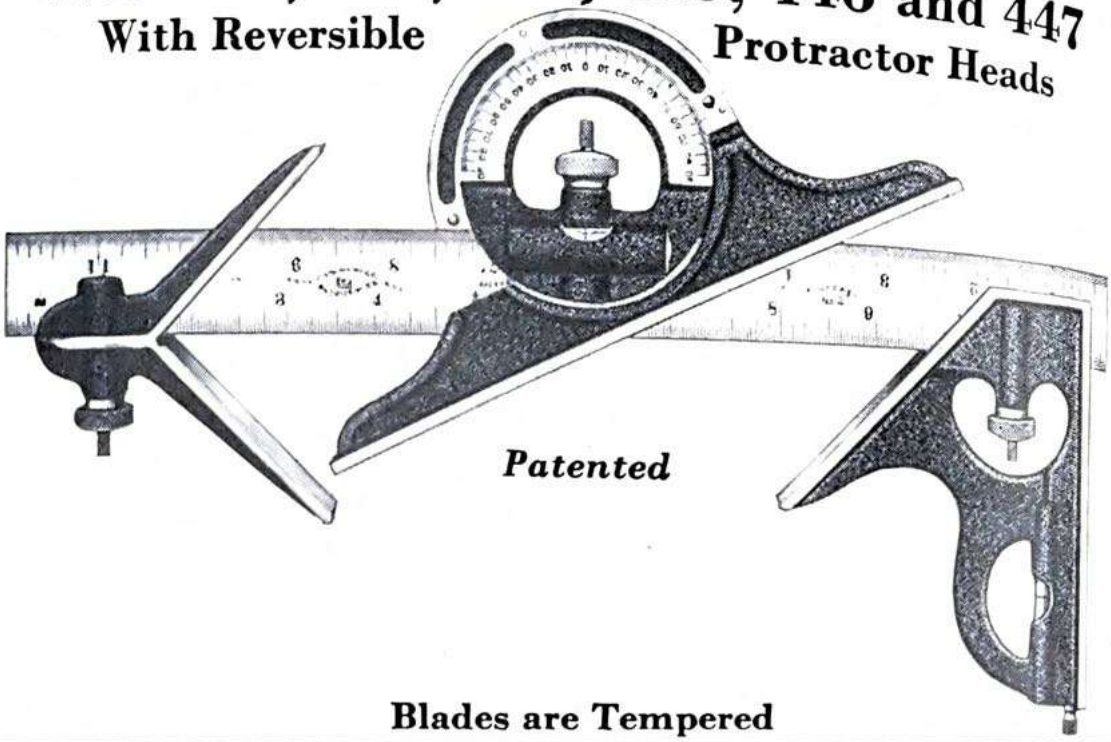
*No. 7 Graduation not furnished on 18″ and 24″ Sets. Packed one in a box.

Combination Sets

Nos. 438, 439, 442, 443, 446 and 447

With Reversible Protractor Heads

438
439
442
443
446
447



Patented

Blades are Tempered

With Square and Center Heads Hardened			With Square and Center Heads Not Hardened		
No.	Size	Price	No.	Size	Price
438 English	9 inch	$9.50	439 English	9 inch	$7.20
	12 "	10.40		12 "	7.80
	18 "	11.50		18 "	8.70
	24 "	12.40		24 "	9.60
442 Metric	20 cm	9.50	443 Metric	20 cm	7.20
	30 "	10.40		30 "	7.80
	50 "	11.50		50 "	8.70
	60 "	12.40		60 "	9.60
446 English and Metric	20 cm	9.50	447 English and Metric	20 cm	7.20
	30 "	10.40		30 "	7.80
	50 "	11.50		50 "	8.70
	60 "	12.40		60 "	9.60

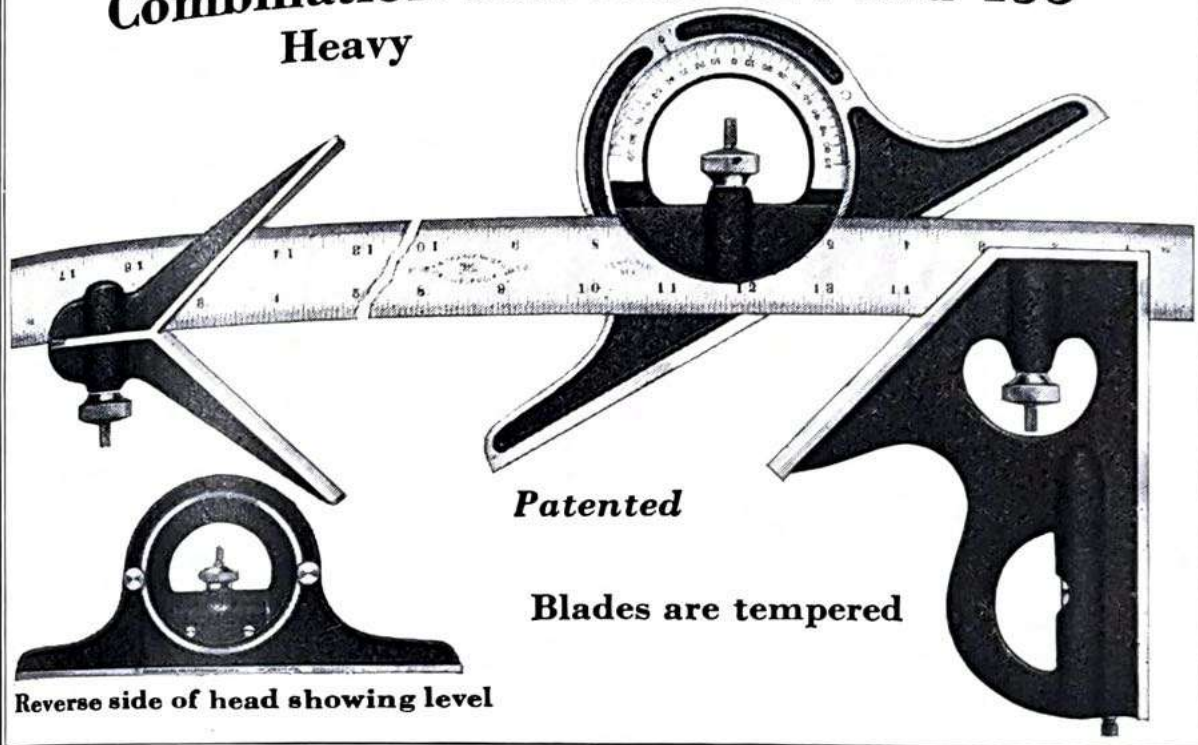
GRADUATIONS

Nos. 438 and 439—Nos. 4 or 7*			Nos. 442 and 443	Nos. 446 and 447
1st Corner	8	16	1st and 3rd corners: mm	1st corner: mm
2nd Corner	16	32	2nd and 4th corners: 1-2 mm	2nd corner: 32nds"
3rd Corner	32	64		3rd corner: 1-2 mm
4th Corner	64	100		4th corner: 64ths"

*No. 7 Graduation not furnished on 18" and 24" Sets. Packed one in a box.

Combination Sets Nos. 427 and 435

Heavy



427

435

440

448

Patented

Blades are tempered

Reverse side of head showing level

With Square and Center Heads Hardened

No.	Size	Price	No.	Size	Price
427 English	18 inch 24 "	$13.20 14.40	435 English and Metric	50 cm 60 "	$13.20 14.40

Combination Sets Nos. 440 and 448

Heavy—With Reversible Protractor Heads

Patented

Blades are Tempered

With Square and Center Heads Hardened

No.	Size	Price	No.	Size	Price
440 English	18 inch 24 "	$14.10 15.60	448 English and Metric	50 cm 60 "	$14.10 15.60

GRADUATIONS

Nos. 427 and 440—No. 4 Graduation		Nos. 435 and 448
1st Corner	8	1st corner: mm
2nd Corner	16	2nd corner: 32nds″
3rd Corner	32	3rd corner: 1-2 mm
4th Corner	64	4th corner: 64ths″

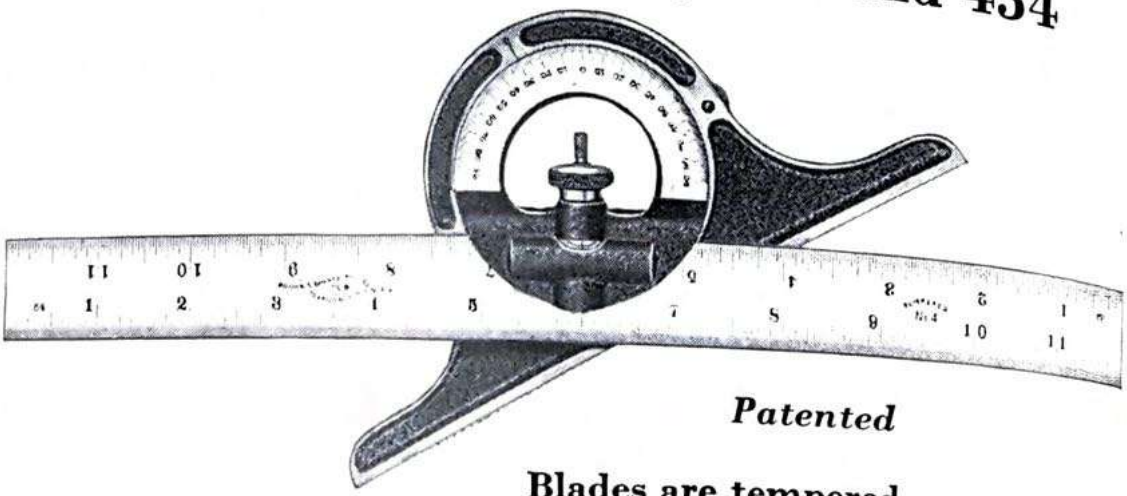
Packed one in a box.

Protractors Nos. 450, 452 and 454

450

452

454



Patented

Blades are tempered

456

458

460

No.	Size	Price	No.	Size	Price
450 English	9 inch	$4.50	454 English and Metric	20 cm	$4.50
	12 "	4.90		30 "	4.90
	18 "	6.00		50 "	6.00
	24 "	6.90		60 "	6.90
452 Metric	20 cm	4.50			
	30 "	4.90			
	50 "	6.00			
	60 "	6.90			

Protractors Nos. 456, 458 and 460

With Reversible Protractor Heads

Patented

Blades are tempered

No.	Size	Price	No.	Size	Price
456 English	9 inch	$5.70	460 English and Metric	20 cm	$5.70
	12 "	6.10		30 "	6.10
	18 "	7.20		50 "	7.20
	24 "	8.10		60 "	8.10
458 Metric	20 cm	5.70			
	30 "	6.10			
	50 "	7.20			
	60 "	8.10			

GRADUATIONS

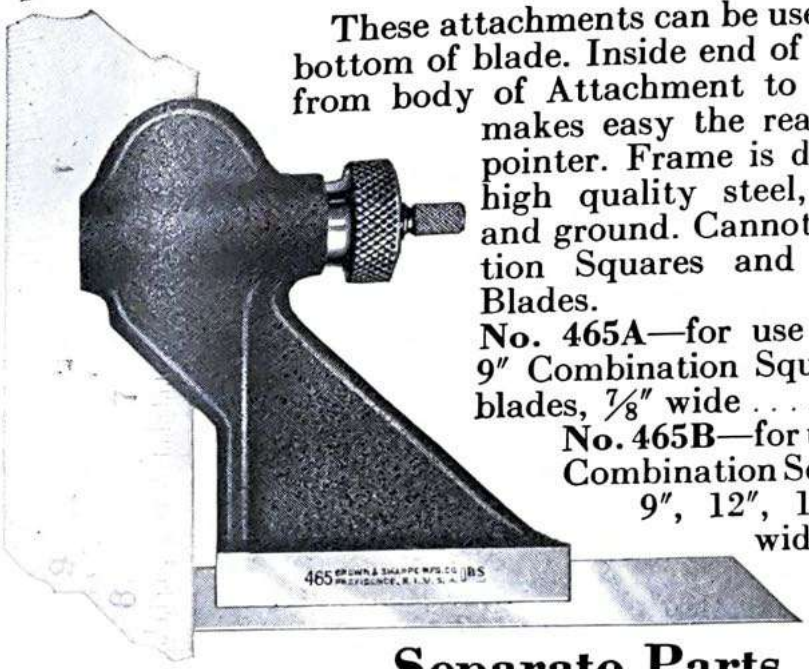
Nos. 450 and 456—No. 4 or 7*			Nos. 452 and 458	Nos. 454 and 460
1st Corner	8	16	1st and 3rd corners: mm	1st corner: mm
2nd Corner	16	32		2nd corner: 32nds″
3rd Corner	32	64	2nd and 4th corners: 1-2 mm	3rd corner: 1-2 mm
4th Corner	64	100		4th corner: 64ths″

*No. 7 not furnished with 18″ and 24″ Protractors. Packed one in a box.

Height Gage Attachments Nos. 465A and 465B

Patented

FOR USE ON BROWN & SHARPE COMBINATION SQUARES AND SETS



465 A

465 B

These attachments can be used from extreme top to bottom of blade. Inside end of pointer blade projects from body of Attachment to edge of blade, which makes easy the reading of the height of pointer. Frame is drop forged. Pointer is high quality steel, hardened, tempered and ground. Cannot be used on Combination Squares and Sets having Heavy Blades.

No. 465A—for use on Brown & Sharpe 9″ Combination Squares and Sets having blades, ⅞″ wide **$2.50**

No. 465B—for use on Brown & Sharpe Combination Squares and Sets having 9″, 12″, 18″ or 24″ blades, 1″ wide **$2.50**

Packed one in a box.

Separate Parts

FOR COMBINATION SQUARES, COMBINATION SETS AND PROTRACTORS

Size	*Price of Blades	Price of Square Heads		Price of Center Heads		Price of Protractors	
	Tempered	Not Hardened	Hardened	Not Hardened	Hardened	Plain	Reversible
4″ or 10 cm	$0.80	$0.90	$1.50				
6″ or 15 cm	1.20	.90	1.90	$0.75	$1.50		
9″ or 20 cm	**1.50	1.50	2.40	.75	1.90	$3.00	$4.20
12″ or 30 cm	1.90	1.50	2.40	.75	1.90	3.00	4.20
18″ or 50 cm	3.00	1.50	2.40	.75	1.90	3.00	4.20
24″ or 60 cm	3.90	1.50	2.40	.75	1.90	3.00	4.20
18″ or 50 cm Hy.	3.90		3.50		2.70	4.50	5.10
24″ or 60 cm Hy.	5.40		3.50		2.70	4.50	5.10

*No. 4 Graduation 8ths, 16ths, 32nds, and 64ths furnished unless otherwise specified; No. 7 Graduation 16ths, 32nds, 64ths, and 100ths can be furnished on all except Heavy Blades, when ordered.

**In ordering 9″ Square Heads, Center Heads or Protractors, specify whether the blade on which head will be used is ⅞″ or 1″ in width.

Scribers . . . . . **20c.** each

Level Glasses . . . . . **20c.** each

Level Glasses and setting same . . . . . **45c.** each

Depth Gage Attachment No. 468

Patented

For Use on 9″, 12″, 18″ and 24″, Brown & Sharpe Combination Squares and Sets

468 **ENGLISH MEASURE** **Range, 0 to 4½″**
METRIC MEASURE **Range, 0 to 114 mm**

These attachments are particularly useful in measuring the depth of wide recesses. The frame is drop forged.

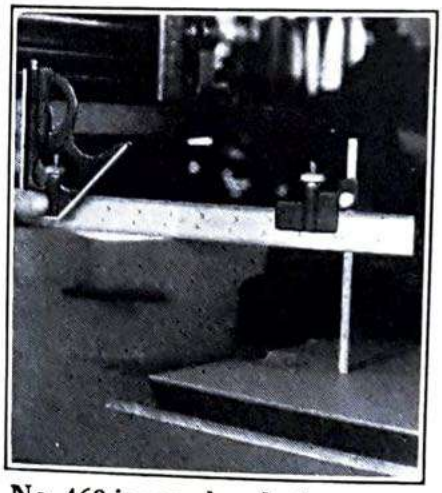
English Measure: 6″ blade graduated in 32nds and 64ths, or 64ths and 100ths. Blade with 32nd and 64th graduations is furnished, unless otherwise specified.

Metric Measure: 15 cm blade graduated in mm's and ½ mm's.

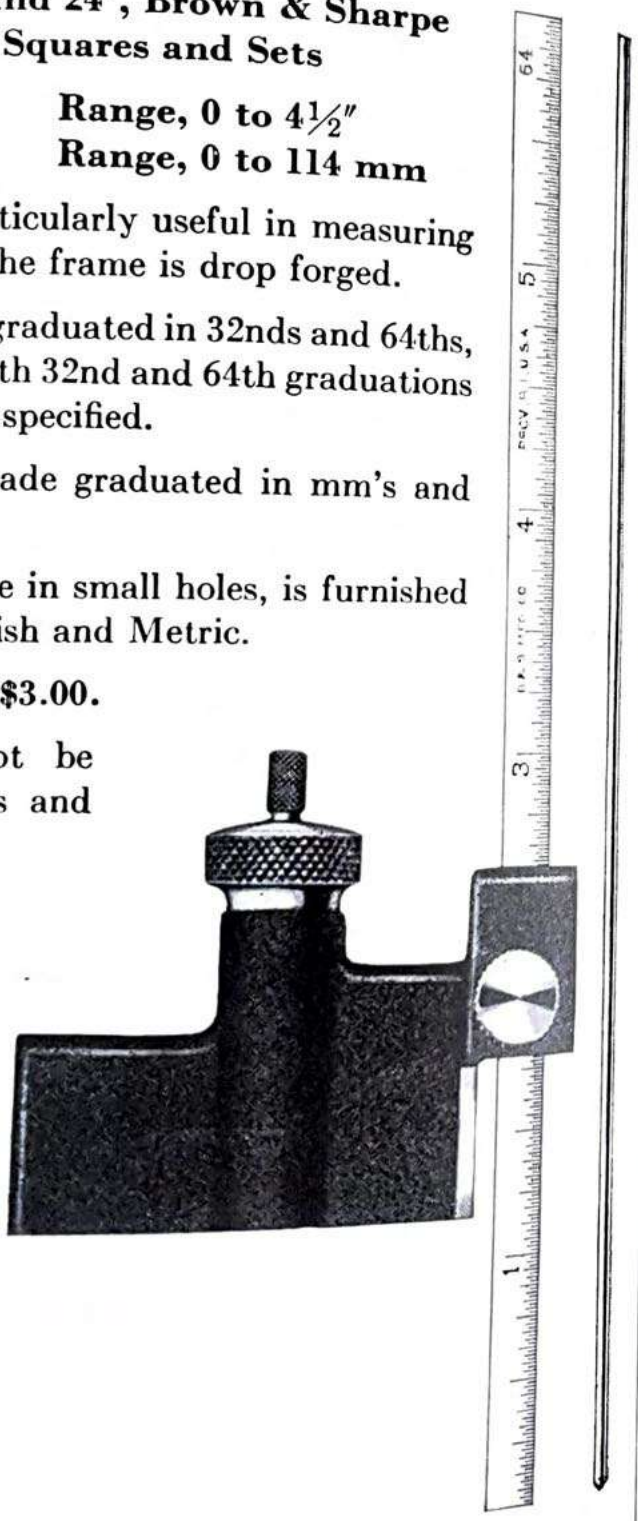
A rod, 5/64″ diameter, for use in small holes, is furnished with Attachments, both English and Metric.

Price, with blade and rod, **$3.00.**

These Attachments cannot be used on combination squares and sets having heavy blades.



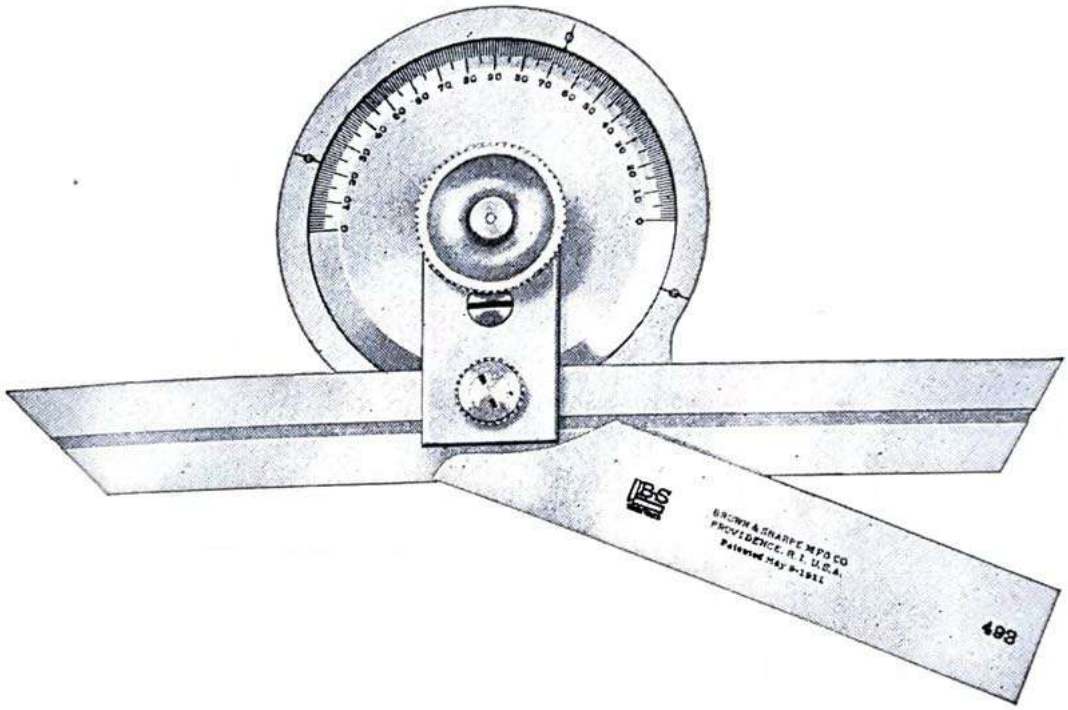
No. 468 is very handy for measuring depths which would ordinarily be difficult to obtain.



Packed one in a box.

Bevel Protractor No. 493

493



Protractor with 6″ blade.....Price, $13.50 Case, $2.25

Protractor with 12″ blade.....Price, 14.75 Case, 3.00

Extra blades: 6″ Price $1.75; 12″ Price $3.00

Adapted for all classes of work where angles are to be laid out or established which do not require such a fine degree of accuracy as is possible with a Protractor having a Vernier.

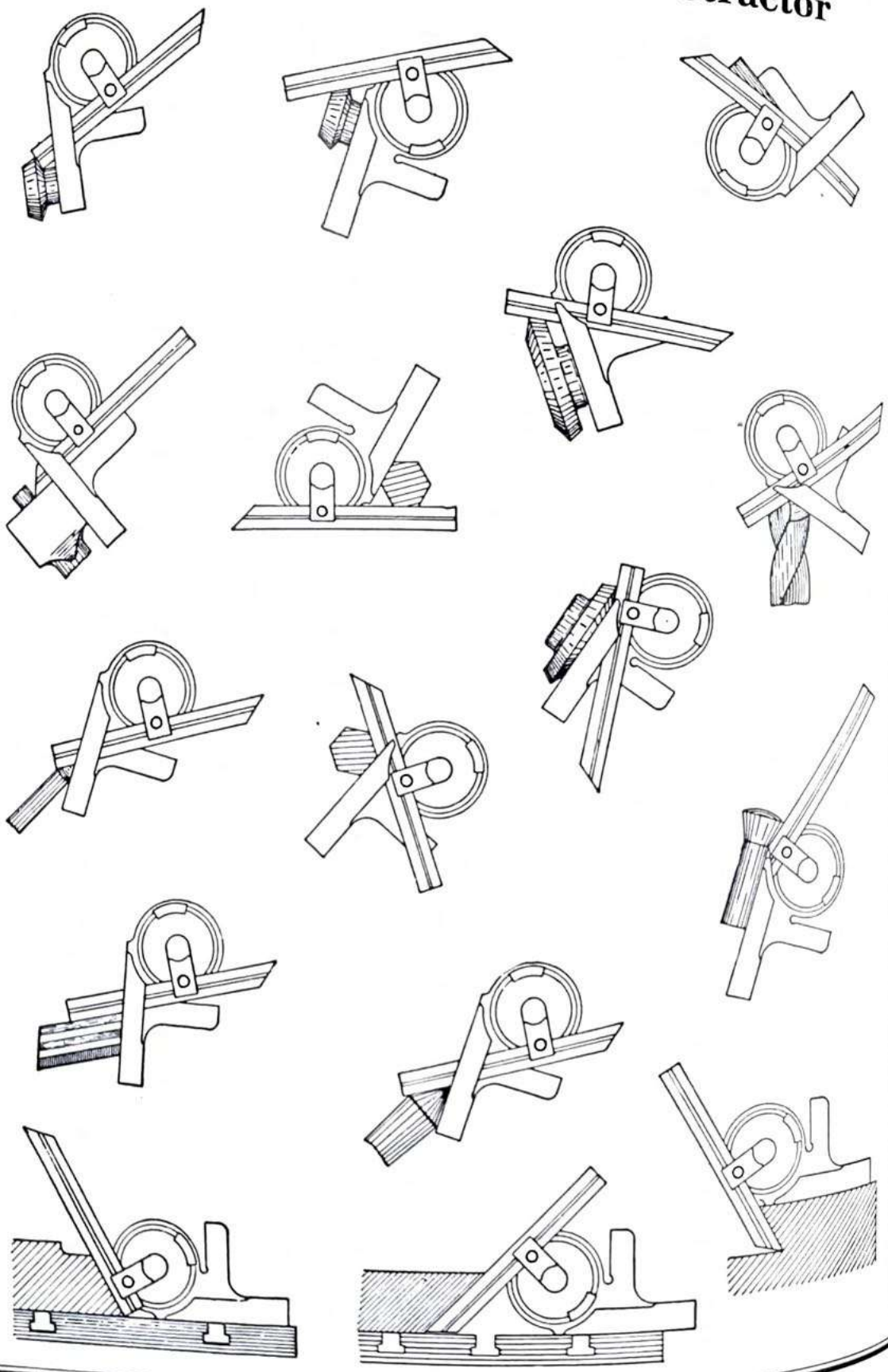
One side of the tool is flat, thus permitting it to be laid flat upon the paper or work.

The dial is accurately graduated to degrees over an arc of 180° reading 0 to 90° from each extremity of the arc. It turns on a large central stud, which is hardened and ground, and can be rigidly clamped in any position after setting.

The blade is about 1/16″ thick, can be moved back and forth its entire length and clamped independently of the dial.

Packed one in a box.

A Few Uses of the Bevel Protractor



Reading the Vernier

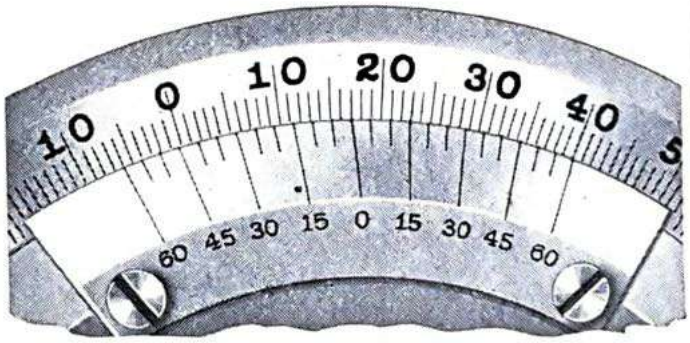
On Universal Bevel Protractor

THE Vernier indicates every 5 minutes (5′), or one twelfth of a degree. Each space upon the Vernier is 5 minutes shorter than two spaces on the scale.

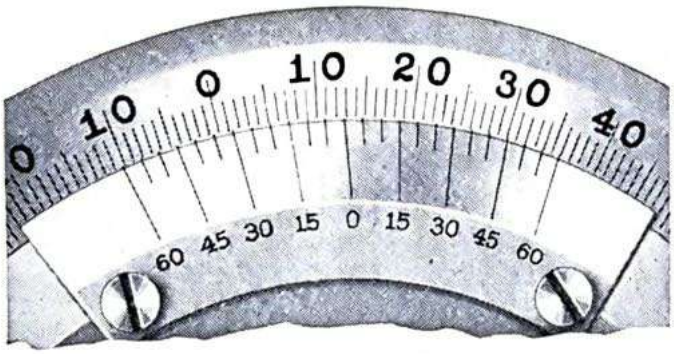
When the zero on the Vernier exactly coincides with a graduation on the scale, the reading is in exact degrees, as in upper cut in which the reading is 17° 0′. When the zero graduation of the Vernier does not exactly coincide with a graduation on the scale, the graduation on the Vernier that does coincide with a graduation on the scale indicates the number of 12ths of a degree or 5 minutes to be added to the whole degree reading.

Read off directly from the scale the number of whole degrees between 0 on the scale and 0 on the Vernier. Then count, in the same direction, the number of divisions from the 0 of the Vernier to the first line on the Vernier that coincides with a line on the scale. As each division on the Vernier represents 5 minutes, the number of these divisions multiplied by 5 will be the number of minutes to be added to the whole number of degrees.

Example: Lower cut shows the zero on the Vernier between 12 and 13 on the scale. Counting to the right from zero on the scale, the zero on the Vernier has therefore moved twelve whole degrees. In the same direction the 10th line of the Vernier, representing 50 minutes (50′), is the line which exactly coincides with a line on the scale. We, therefore, have 50 minutes as indicated by the Vernier, to be added to the reading of twelve degrees on the scale. The reading, then, is 12° 50′.

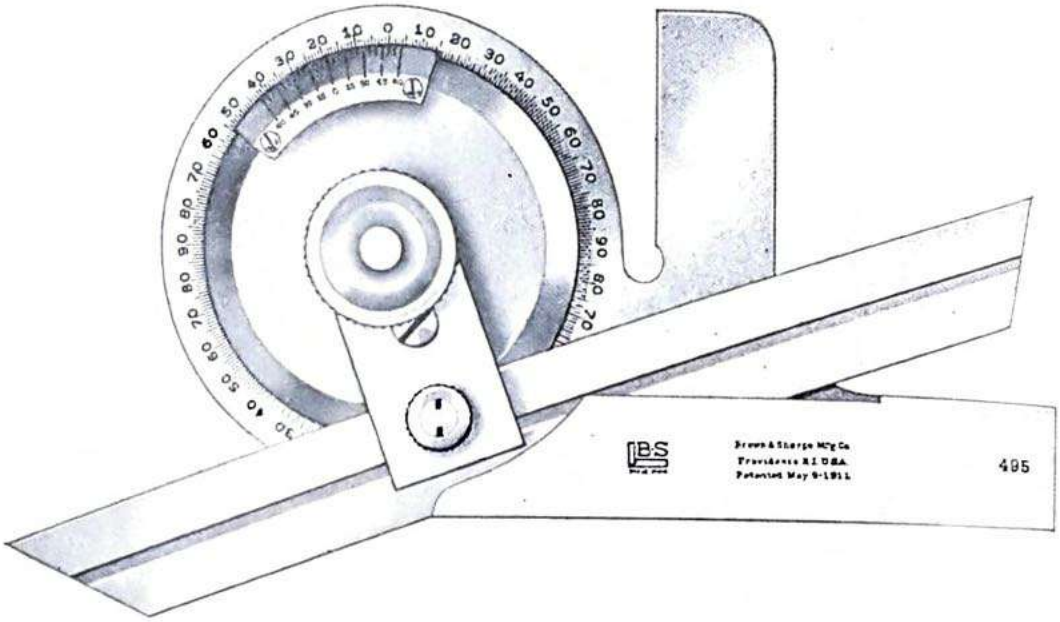


Since the divisions, both on the scale and on the Vernier, are numbered both to the right and left from a basis of zero, any size angle can be measured, and the readings on the scale and on the Vernier, are taken either to the right or left, according to the direction in which the zero on the Vernier is moved.



Universal Bevel Protractor
No. 495

495



Protractor with 6″ blade.....Price, $18.50 Case, $2.00
Protractor with 12″ blade.....Price, 19.75 Case, 3.00

Extra Blades: 6″ Price $1.75; 12″ Price $3.00

Protractor No. 495 is well adapted for all classes of work where angles are to be laid out or established.

One side of the tool is flat, thus permitting it to be laid flat upon the paper or work.

The dial is graduated accurately to degrees the entire circle. The swivel turns on a large central stud, which is hardened and ground, and can be rigidly clamped by a thumb nut.

The graduations are below the surface, protecting them from wear.

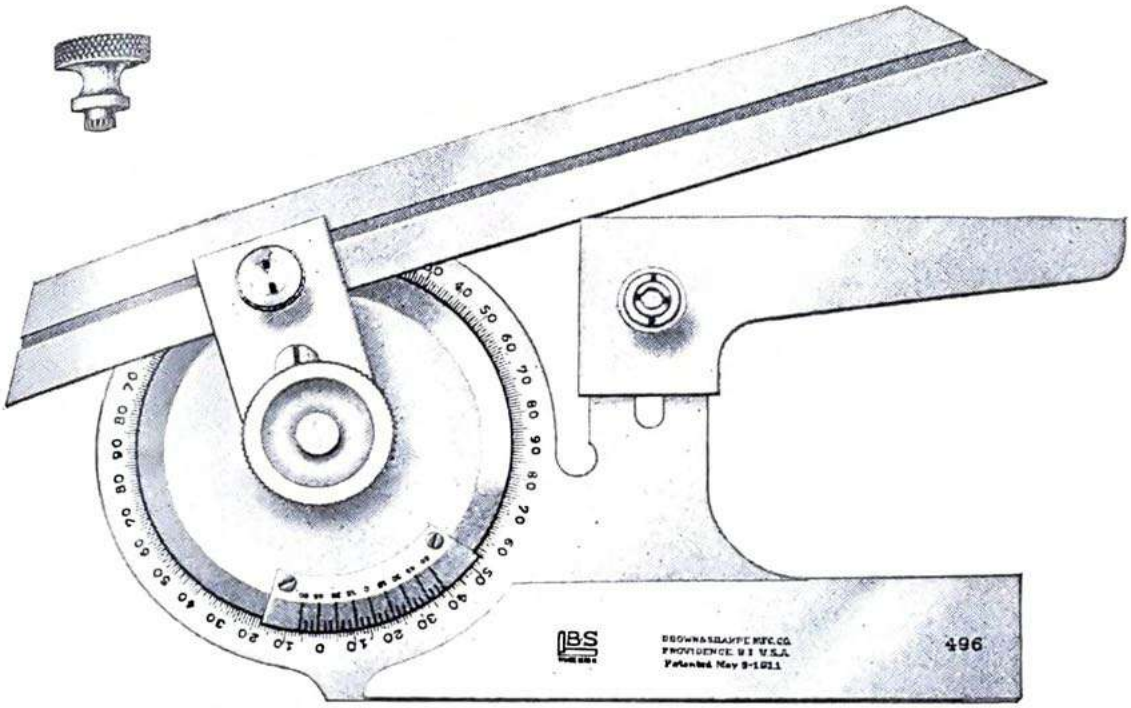
The Vernier adds materially to the use of the protractor in obtaining fine measurements. It reads to 5 minutes or 1-12 of a degree.

The blade is about 1/16″ thick, can be moved back and forth its entire length and clamped independently of the dial.

Packed one in a box.

Universal Bevel Protractor
No. 496

496



WITH ACUTE ANGLE ATTACHMENT

Protractor with 6″ blade.....Price, $22.50 Case, $2.00

Protractor with 12″ blade.....Price, 23.75 Case, 3.00

Extra Blades: 6″ Price $1.75; 12″ Price $3.00

The Universal Bevel Protractor with Acute Angle Attachment is designed for all classes of work where angles are to be laid out and, with the attachment, extremely small angles can be easily and quickly established. Alignments are correct, and workmanship throughout the best.

One side of the tool is flat, thus permitting its being laid flat upon the paper or work. The dial is accurately graduated to degrees the entire circle, the graduated surface being depressed, thus protecting the graduations from wear.

A Vernier, which reads to 5 minutes or one-twelfth of a degree, adds materially to the fineness to which angles can be laid out. A small thumb pinion is furnished for securing extremely fine adjustments. It is inserted in the back of the protractor and engages with a gear which swings the dial in either direction.

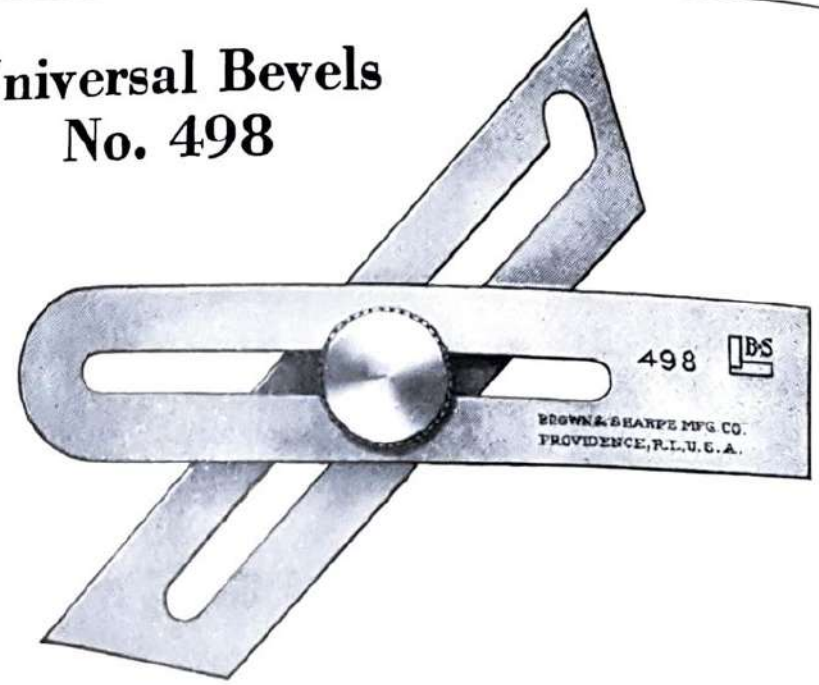
The blade is about 1/16″ thick, can be moved back and forth its entire length and clamped independently of the dial.

Packed one in a box.

Universal Bevels No. 498

498

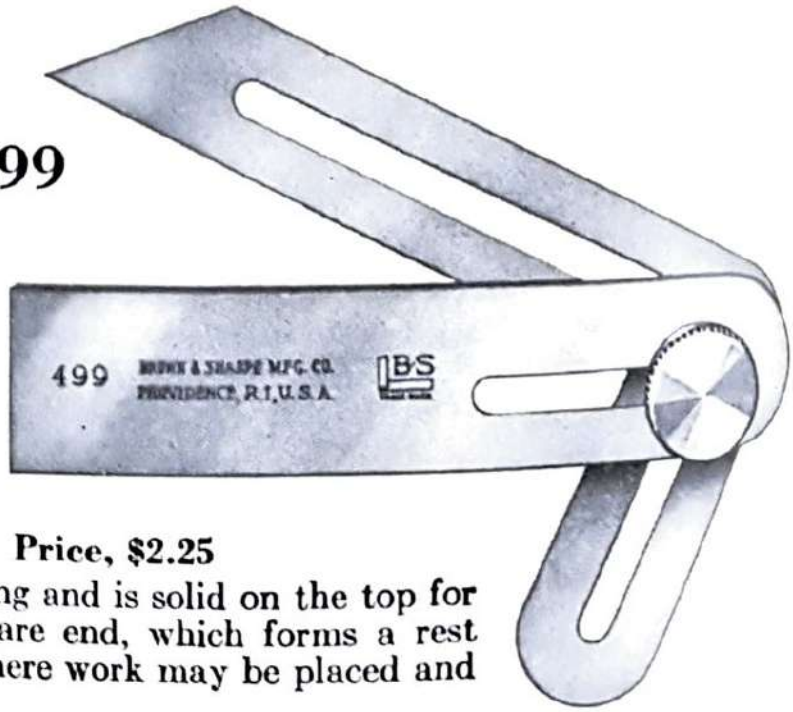
499



The slot in the blade of the 3″ bevel has an offset which enables the user to get angles that could not be obtained with a straight slot in the blade. The 1¼″ bevel is particularly useful on very small work.

No.	Length of Head and Tongue, Inches	Width of Head and Tongue, Inches	Price
498	1 1-4 3	1-4 5-8	$2.40 2.40

Universal Bevel No. 499



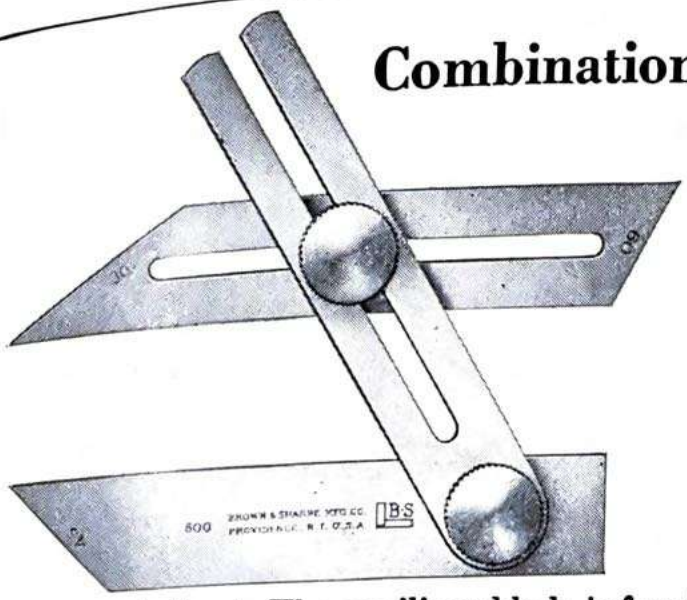
Price, $2.25

The case is 3″ long and is solid on the top for 1⅝″ from the square end, which forms a rest under the blade where work may be placed and accurately fitted.

Each of the above packed one in a box.

Combination Bevel No. 500

Price, $2.50

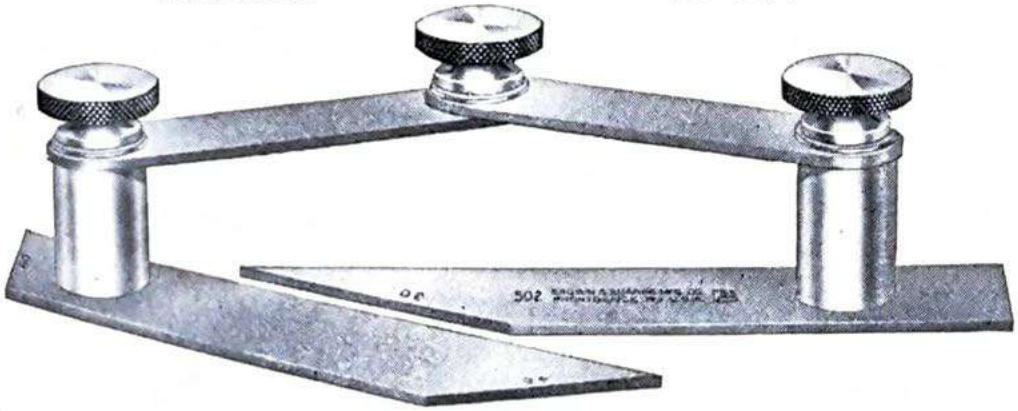


With this tool it is possible to transfer any angle from one surface to another. It can also be used for laying out angles as the back of the tool is smooth and can be laid flat on the work. **500**

The stock is 4″ long and has a stud riveted to it which holds the split blade. The blade can be swung to any angle and clamped by the knurled nut. The auxiliary blade is furnished with a clamp bolt and can be quickly attached to the slotted blade and clamped in position. One end of the stock is square and the other end is beveled to 45°. The auxiliary blade is beveled on one end to 60° and on the other end to 30°.

Improved Combination Bevel No. 502 **502**

Patented **Price, $4.00**

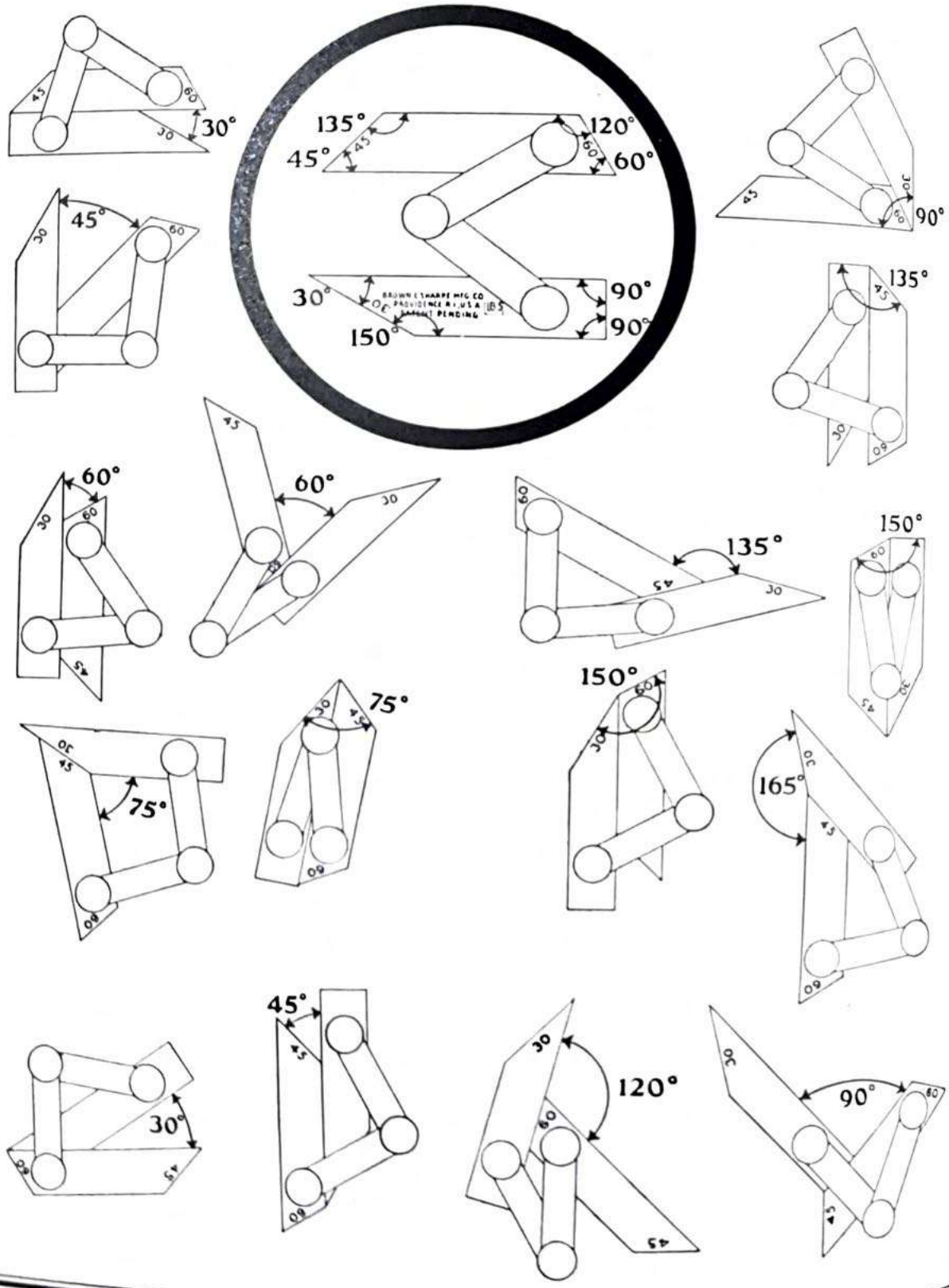


With this tool any angle can be transferred from one surface to another. There is no arm to obstruct view of angle and tool can be laid flat on work. Blades may be adjusted without turning clamp nuts or may be securely locked in any position by tightening these nuts. Bevel will straddle projection up to $\frac{7}{8}$″ high and its blades may be used on alternate sides of projection. Equally useful to toolmakers, draftsmen and patternmakers.

Blades are steel, not hardened, and are $4\frac{13}{16}$″ long. They are accurately ground on all edges and ends are ground to angles of 30°, 45°, 60° and 90°. To reduce weight, the two posts are made of a light metal. For uses of this tool, see page 328.

Each of the above packed one in a box.

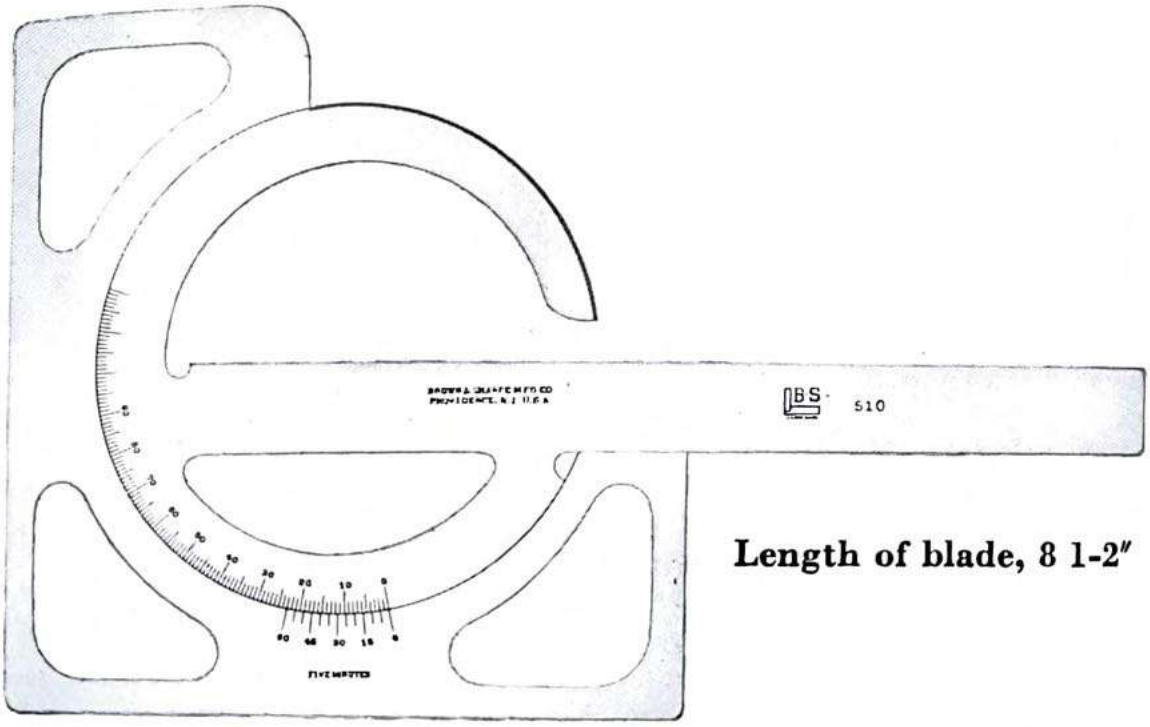
A Few Uses of Improved Combination Bevel No. 502



Draftsmen's Protractor No. 510

Price, $13.50 **Case, $3.00**

510



Length of blade, 8 1-2″

This protractor was originally developed by Brown & Sharpe to provide draftsmen with a handy and accurate means of laying out and transferring angles.

Can be quickly set to any angle, used either side up and on either of the two outside edges of the frame. It can be used to advantage in dividing a circle, transferring angles or laying off a given angle, without resetting, on either side of a line.

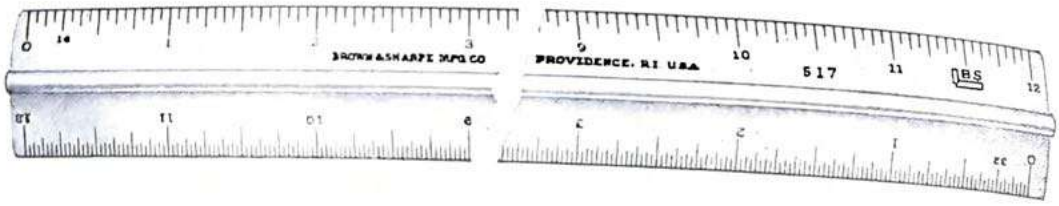
The Vernier reads to five minutes.

This Protractor forms a convenient extension of a T square and frequently takes the place of 45° and 60° triangles.

Packed one in a box.

Scales for Draftsmen
No. 517

517



These Scales are of steel, nickel plated, and of a design combining lightness with strength. A 12″ scale weighs but 2½ oz. The under side of the scale is beveled, thus bringing the graduated side close to the work, a distinct advantage in laying out work accurately. Each scale is graduated on the two upper edges and each graduation is the same for its full length, thus eliminating the confusion caused by many dissimilar graduations on one edge.

No.	Length, Inches	Graduation	Price
517	6	On one edge 1-64″ other edge 1-100″	$1.70
	6	On one edge 1-32″ other edge 1-64″	1.70
	6	On one edge 1-16″ other edge 1-32″	1.70
	12	On one edge 1-64″ other edge 1-100″	2.00
	12	On one edge 1-32″ other edge 1-64″	2.00
	12	On one edge 1-16″ other edge 1-32″	2.00

Packed one in a box.

Special Scales Made to Order

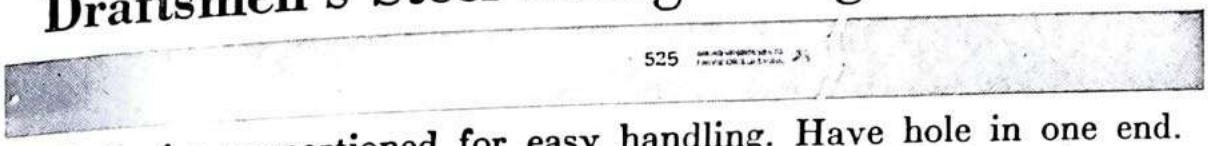
Prices on Application

Straight Edges

Brown & Sharpe Straight Edges are unexcelled for use in accurately drawing straight lines and for checking surfaces for straightness. They are carefully made on specialized equipment and each straight edge is checked for conformity to a master. Only the highest grade of tool steel is used.

The larger sizes, except those for draftsmen, are marked at two balancing points with arrows. Straight edges so marked should be suspended at these points to preserve their accuracy and counteract any tendencies toward deflection caused by their length and weight. 525 526

Draftsmen's Steel Straight Edges No. 525



Each size proportioned for easy handling. Have hole in one end. Draftsmen's Straight Edges do not have balancing points as they are designed to be used flat against a drawing board. Not hardened.

No.	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price
525	15	1 1-4	3-64	$2.30	42	2 1-4	1-16	$6.50
	18	1 3-4	5-64	2.60	48	2 1-2	3-32	8.00
	24	1 3-4	5-64	3.00	60	3	7-64	12.00
	36	2	3-32	5.25	72	3	7-64	15.00

Each of the above packed one in a package.

Beveled Steel Straight Edges No. 526

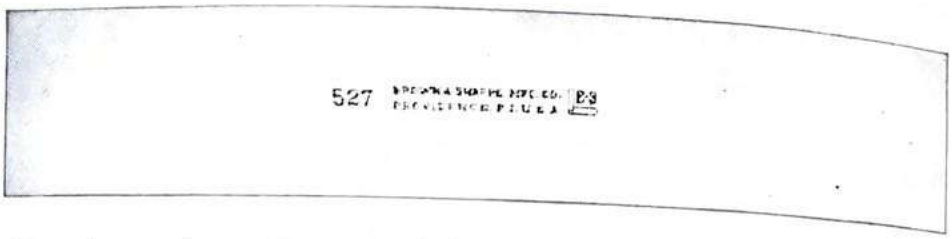
Made straight on beveled edge. Thickness of each size proportioned for rigidity. One edge only beveled. Beveled edge 1/16″ in thickness. Thirty-six inch size and larger have balancing points. Not hardened.

No.	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price
526	12	1 3-8	3-16	$3.00	48	3	1-4	$16.25
	18	1 3-4	3-16	4.40	60	3 1-8	9-32	22.00
	24	2	1-4	6.75	72	3 1-8	9-32	32.00
	36	3	1-4	11.50				

Each of the above packed one in a package.

Hardened Steel Straight Edges No. 527

527



528 Hardened on edges, these straight edges will not bruise or wear easily. They are especially useful where straight edges are required for hard and continuous service. 39″ size has balancing points.

No.	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price
527	3 7-8	15-16	1-16	$1.00	17	2 7-16	5-64	$6.00
	5 1-2	1 1-8	5-64	1.50	20	2 7-8	7-64	7.00
	7	1 3-8	5-64	1.75	27	3	7-64	9.00
	10 3-4	1 3-4	5-64	3.00	33	3 1-4	1-8	12.00
	13 3-4	2 1-16	5-64	4.00	39	3 5-8	1-8	15.00

10¾″ size and under packed six in a box. 13¾″ and over packed one in a package.

Standard Steel Straight Edges No. 528

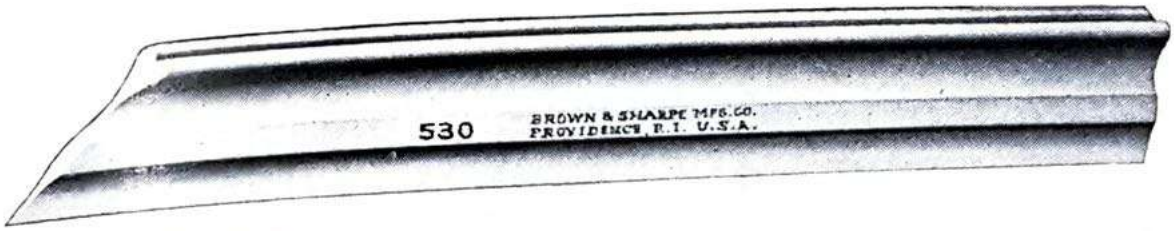
For machinists' and shop use. Not hardened. Sizes 36″ and larger have balancing points.

No.	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price	Length, Inches	Width, Inches	Thickness, (Approx.) Inches	Price
528	6	1	5-64	$0.75	36	2	3-32	$6.50
	12	1 1-4	5-64	1.75	48	2 1-2	3-32	11.00
	18	1 3-4	5-64	2.75	60	3	7-64	16.00
	24	1 3-4	5-64	4.00	72	3	7-64	22.00

6″ size packed six in a box. 12″ size and over packed one in a package.

Toolmakers' Knife-Edge Straight Edges No. 530

530



For work requiring extreme accuracy, the knife-edge straight edge is commonly used. The testing edge is very narrow and is of semicircular cross section so that a line contact is obtained instead of a flat contact, as with straight edges having flat edges. This line contact shows any minute curvatures which may exist, and as the edge is curved, the accuracy of the test will not be affected if the straight edge is not held exactly at right angles with the surface being tested. Made of high grade tool steel, hardened.

These straight edges are given a seasoning process which removes all strains and prevents warping.

No.	Length, Inches	Width, Inches	Price
530	2 1-4	13-16	$3.30
	3 1-4	13-16	4.50
	4 1-2	13-16	5.70
	6 1-4	13-16	8.40

The above Straight Edges are furnished in cloth-covered cases.

	Price
Test bar in cloth-covered case	$4.80
Case for complete set	3.00
Cloth-covered case for test bar	.30
Cloth-covered case for single straight edge	.30

Packed one in a box.

Toolmakers' Knife-Edge Straight Edge Set No. 531

531

Price, Complete in Case, $28.20

Consists of Glass Test Bar and 4 Straight Edges, 1 each, 2¼", 3¼", 4½" and 6¼" long.

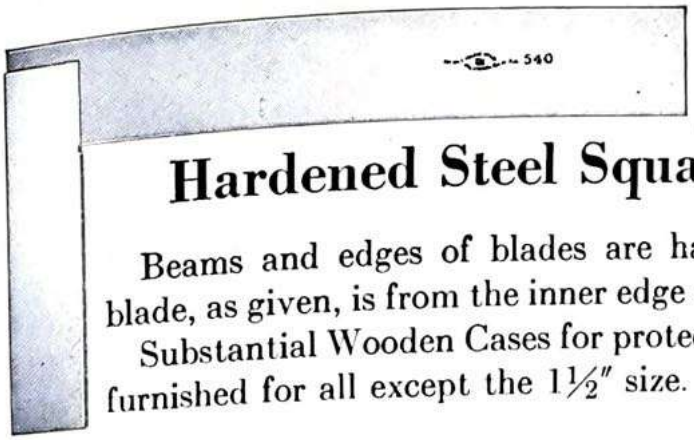
Packed one set in a box.

Squares

Brown & Sharpe Squares are true right angles, both inside and outside. The beams and edges of the blades are accurately ground for straightness and parallelism. Only the highest grade tool steel is used and unusual care goes into their manufacture. Special equipment is used in our inspection department for checking squares.

A good square is a fine precision instrument and should be handled with care. Its accuracy is quickly affected by temperature changes.

The sides of blades are not working surfaces and are not held precisely at right angles with bottoms of beams. Checks against a cylinder are often misleading, as a cylinder offers only a line contact which makes no allowance for slight deviation of the blade sideways.

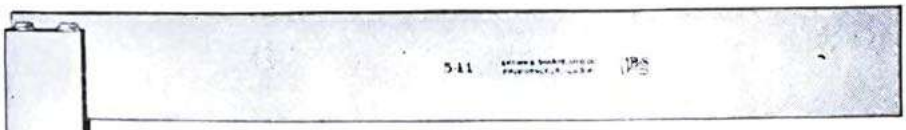


Hardened Steel Squares No. 540

Beams and edges of blades are hardened. The length of blade, as given, is from the inner edge of beam to end of blade. 540

Substantial Wooden Cases for protecting the Squares can be furnished for all except the 1½″ size. 541

No.	Length of Blade, Inches	Length of Beam, Inches	Price, Square Only	Price of Case, Extra
540	1 1-2	1 9-16	$3.60	
	3	2 7-16	4.50	$2.25
	4 1-2	3 9-16	6.90	2.50
	6	4 3-8	9.00	3.00
	9	5 5-8	13.50	3.25
	12	7 1-8	18.00	3.75
	15	8 3-16	30.00	5.00
	18	10 1-4	38.00	5.50



Hardened Steel Squares No. 541

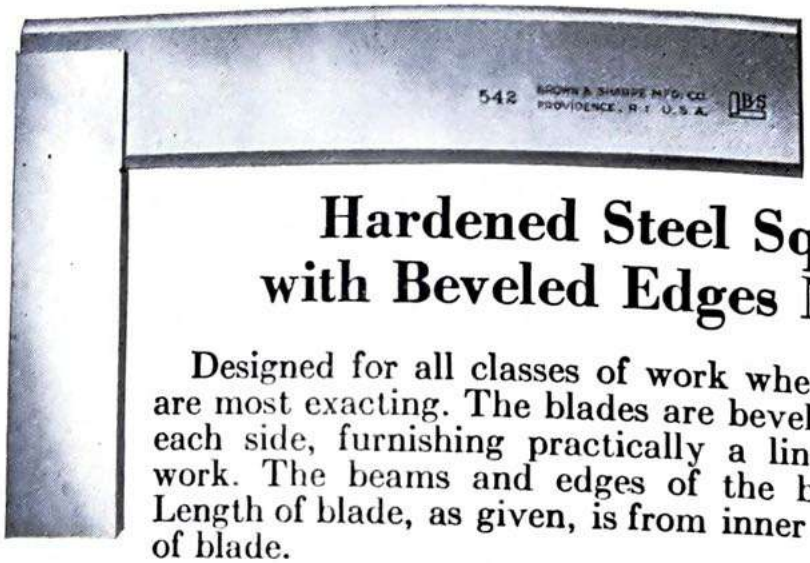
In these large squares, blade is secured to beam by means of screws. The construction is very rigid. Beams and edges of blades are hardened. Length of blade, as given, is from the inner edge of beam to end of blade.

If screws require adjusting, return square to factory.

Substantial Wooden Cases for protecting the Squares can be furnished.

No.	Length of Blade, Inches	Length of Beam, Inches	Price, Square Only	Price of Case, Extra
541	24	13 1-8	$54.00	$7.00
	36	19 1-2	115.00	10.00

Each of the above packed one in box.



542

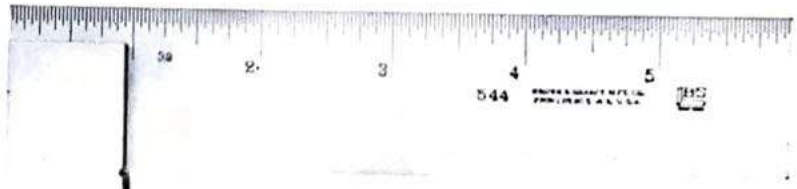
544

Hardened Steel Squares with Beveled Edges No. 542

Designed for all classes of work where the requirements are most exacting. The blades are beveled on both edges of each side, furnishing practically a line contact with the work. The beams and edges of the blade are hardened. Length of blade, as given, is from inner edge of beam to end of blade.

Substantial Wooden Cases for protecting the Squares can be furnished for all except the 1½″ size.

No.	Length of Blade, Inches	Length of Beam, Inches	Price	Price of Case, Extra
542	1 1-2	1 9-16	$4.20	
	3	2 7-16	5.70	$2.25
	4 1-2	3 9-16	8.40	2.50
	6	4 3-8	11.40	3.00



Graduated Steel Squares No. 544

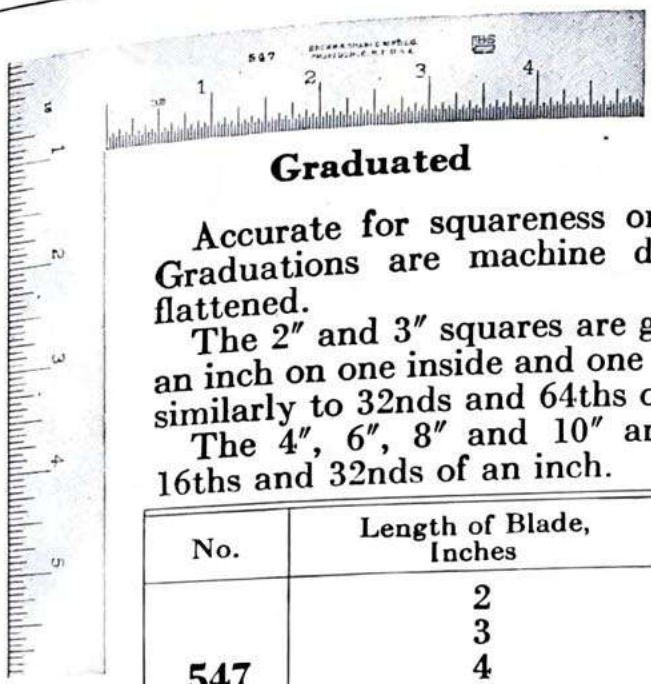
Not Hardened

The length of blade, as given, is the extreme length of the outside edge. It is graduated to 32nds of an inch on outside corner of each side. Graduations are machine divided.

A substantial Wooden Case for protecting the 12″ square when not in use, can be furnished when desired. For price, see following list.

No.	Length of Blade, Inches	Length of Beam, Inches	Price	Price of Case, Extra
544	3	2	$3.90	
	4	2 9-16	5.70	
	6	3 3-4	7.50	
	12	6 1-16	14.40	$3.00

Each of the above packed one in a box.



Graduated

Thin Steel Squares No. 547

Not Hardened

Accurate for squareness on both inner and outer edges. Graduations are machine divided. Squares are carefully flattened. 547

The 2″ and 3″ squares are graduated in 16ths and 64ths of an inch on one inside and one outside corner of one side and similarly to 32nds and 64ths on the other. 550

The 4″, 6″, 8″ and 10″ are graduated on both sides to 16ths and 32nds of an inch.

No.	Length of Blade, Inches	Width of Blade, Inches	Price
547	2	1-2	$2.10
	3	5-8	2.70
	4	3-4	3.60
	6	1	5.10
	8	1 1-8	6.60

Packed as follows: 2″ to 6″, inc., six in a box; 8″, one in a package.

Steel Square For Millwrights No. 550

Not Hardened

Price, $17.00

Designed to meet the wants of those desiring a more accurate tool than the ordinary carpenter's square.

Long blade, 24″ long, 2″ wide
Short blade, 18″ long, 1½″ wide

Inner and outer 90° angles are accurate. Graduations are machine divided and heavy for easy reading.

Both blades are 5/32″ thick at the corner where they unite, and taper down to 1/16″ at their ends. They have similar graduations on both sides, one inside and outside corner being graduated in 8ths and the other inside and outside corners graduated in 16ths. One inside and outside corner of one side has the first inch graduated in 64ths and the second inch in 32nds and similarly on the other side.

Packed one in a package.

Die Makers' Square No. 552

Price { **Square, complete with both straight and offset blades** $5.50
Square, with straight blade only 4.50
Square, with offset blade only 5.00

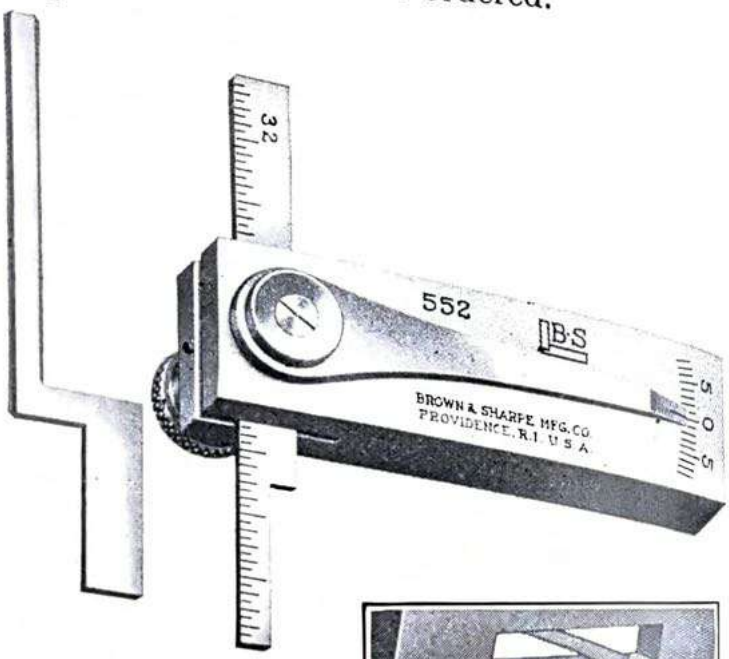
Square sent complete unless otherwise ordered.

552

552 M

Die clearances are easily measured with this tool. It is also very useful to the patternmaker for determining drafts on patterns.

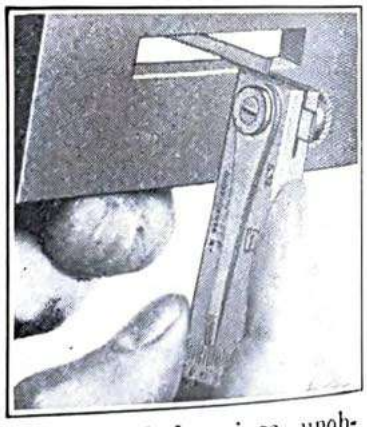
The blade can be set for any angle up to 8° either side of zero. The graduations show the setting in degrees.



Straight blade is 2¼″ long, graduated for one inch on each end, in 32nds of an inch on one side and in 64ths on the other. Blade is 7/32″ wide except for ⅝″ on one end where it is narrowed to 7/64″. This narrow end is very useful in small holes and narrow dies.

Offset blade is used where it would be impossible to sight the straight blade. The offset end is ⅛″ wide, and beveled on both sides of each edge. The remainder of the blade, 7/32″ wide, fits into the body of the square.

The body of the square, approximately 2¼″ x ⅝″ x ⅜″, is hardened and ground.



Offset blade gives unobstructed view.

Die Makers' Square No. 552M

Straight blade is 58 mm long, graduated for 25 mm on each end, on one side in mm and on the other in ½ mm. Otherwise the same as No. 552 above.

Price { **Square, complete with both straight and offset blades** $5.50
Square, with straight blade only 4.50
Square, with offset blade only 5.00

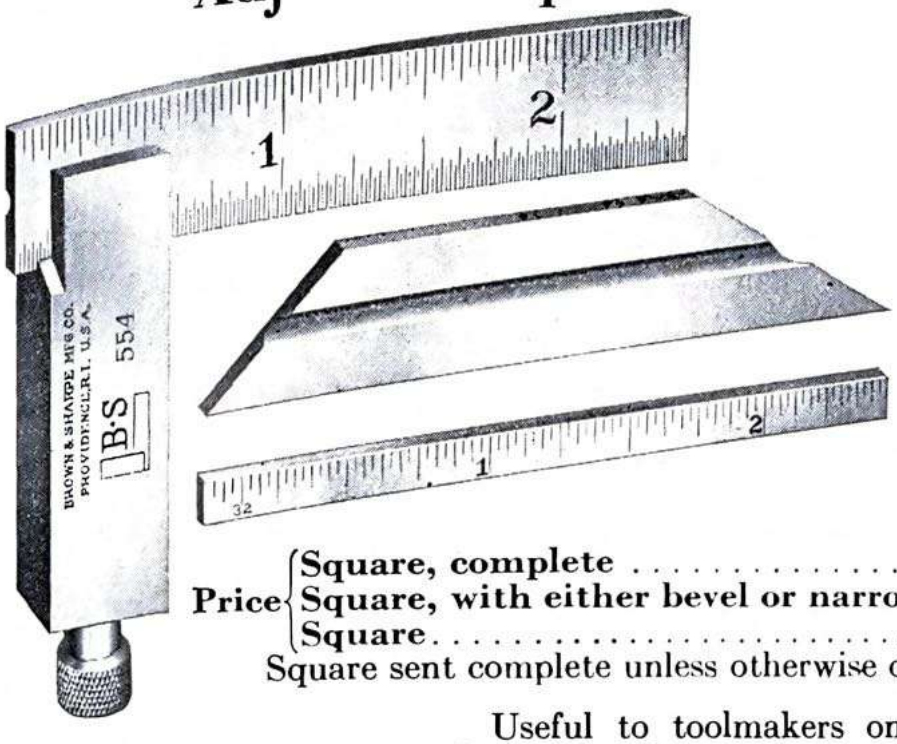
Square sent complete unless otherwise ordered.

Each of the above packed one in a box.

Adjustable Square No. 554

554

554 M

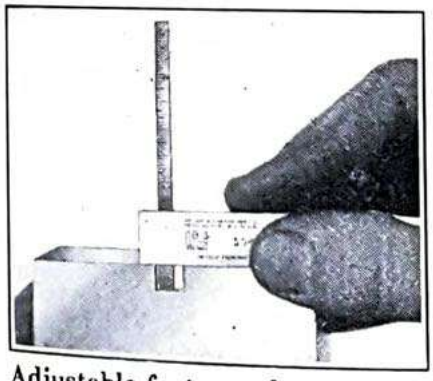


Price { **Square, complete** $4.20
Square, with either bevel or narrow blade 3.90
Square 3.60

Square sent complete unless otherwise ordered.

Useful to toolmakers on small work. Blades may be adjusted to any point within their length and used where it would be impossible to use a fixed blade. Blades are held accurately in body and are readily reversible.

Wide blade, 2½″ long, is graduated on one side, one edge in 32nds and the other in 64ths. For establishing 60° and 45° angles, and for checking angles or thread tools of same degrees, blade with beveled ends is extremely useful. Narrow blade is graduated on one side in 32nds of an inch and can be inserted in small holes. All blades are tempered. Beam is hardened and ground.



Adjustable feature adapts square for a wide variety of uses.

Adjustable Square No. 554M

Narrow blade is graduated on one side in mm. Wide blade, 60 mm long, is graduated on one side, one edge in mm and the other in ½ mm. Otherwise the same as No. 554 above.

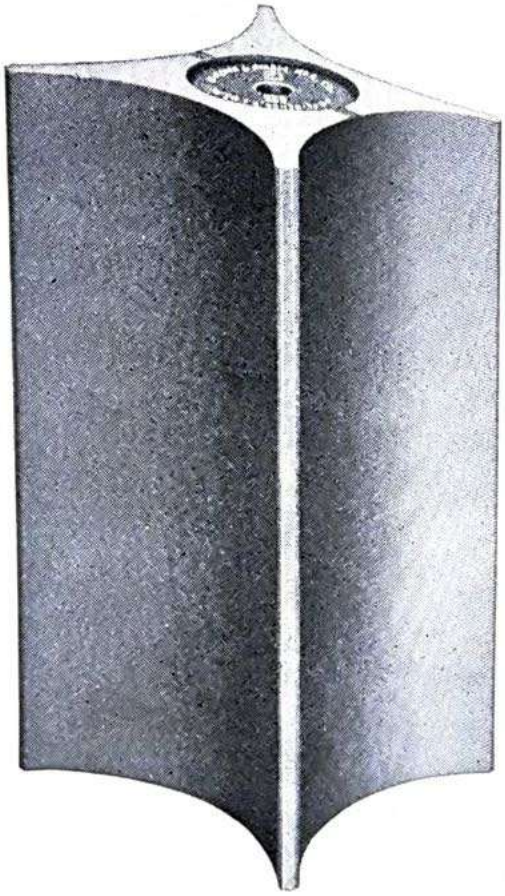
Price { **Square, complete** $4.20
Square, with either bevel or narrow blade 3.90
Square 3.60

Square sent complete unless otherwise ordered.
Each of the above packed one in a box.

Toolmakers' Surface Plate Square No. 559

559

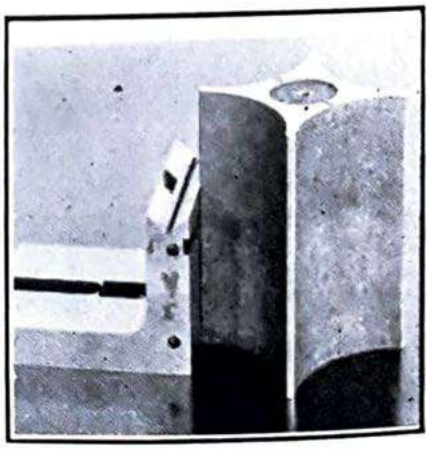
Price, $8.00



The novel design of this surface plate square has many advantages. It is substantial and rugged and of a form most convenient for use on a surface plate. Its one piece construction is not subject to changes from handling and from small variations in temperature. The weight and shape are such that it is not easily upset.

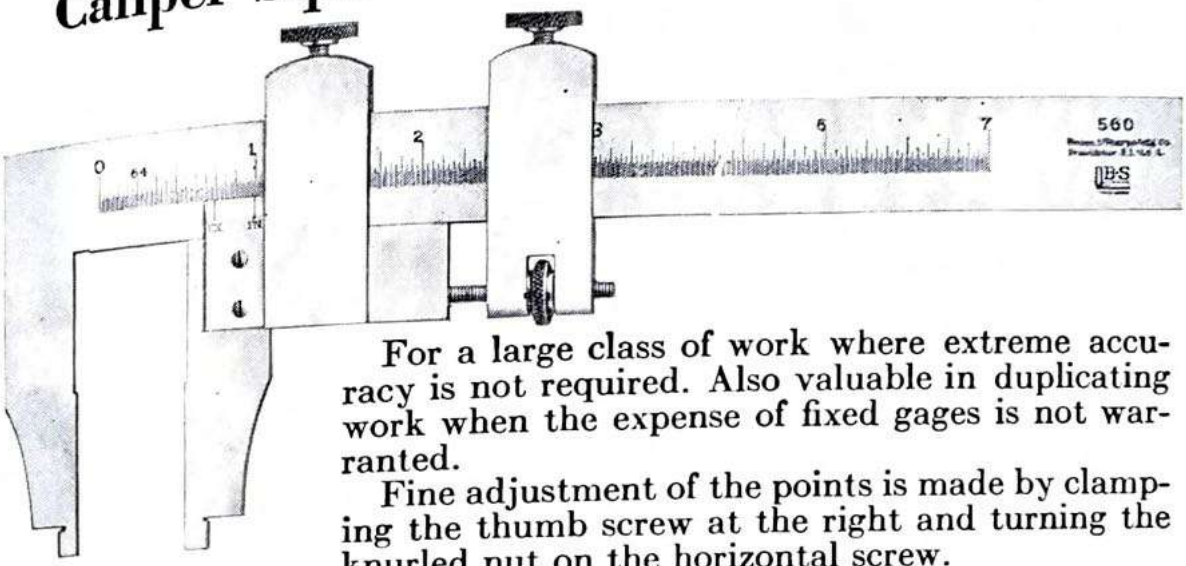
This square is made of hardened steel 4″ high and is approximately 3″ between opposite edges. Both ends are square with all four edges.

Packed one in a box.



Square can be used in a number of positions for a variety of uses, with either end resting on the surface plate.

Caliper Squares Nos. 560, 561 and 562



560

561

562

For a large class of work where extreme accuracy is not required. Also valuable in duplicating work when the expense of fixed gages is not warranted.

Fine adjustment of the points is made by clamping the thumb screw at the right and turning the knurled nut on the horizontal screw.

For inside as well as outside measurements. Jaws are hardened.

No. 560—ENGLISH MEASURE

No.	Size, Inches	Length of Jaws, Inches	Width of Jaws Closed, Inches	Price Without Adjusting Screw	Price With Adjusting Screw	Price of Case
560	4	1 1-2	1-4	$9.00	$10.20	$1.75
	6	2	1-4	10.80	13.20	2.00

Graduation—One side in 64ths, other side in 100ths of an inch.

No. 561—METRIC MEASURE

No.	Size, mm	Length of Jaws, mm	Width of Jaws Closed, mm	Price Without Adjusting Screw	Price With Adjusting Screw	Price of Case
561	100	38	6	$9.00	$10.20	$1.75
	150	50	6	10.80	13.20	2.00

Graduation—One side in half-millimeters, other side in millimeters.

No. 562—ENGLISH AND METRIC MEASURE

No.	Length of English Grad., Inches	Length of Metric Grad., mm	Length of Jaws		Width of Jaws Closed		Price Without Adjusting Screw	Price With Adjusting Screw	Price of Case
			Inches	mm	Inches	mm			
562	4	100	1 1-2	38	1-4	6	$9.00	$10.20	$1.75
	6	150	2	50	1-4	6	10.80	13.20	2.00

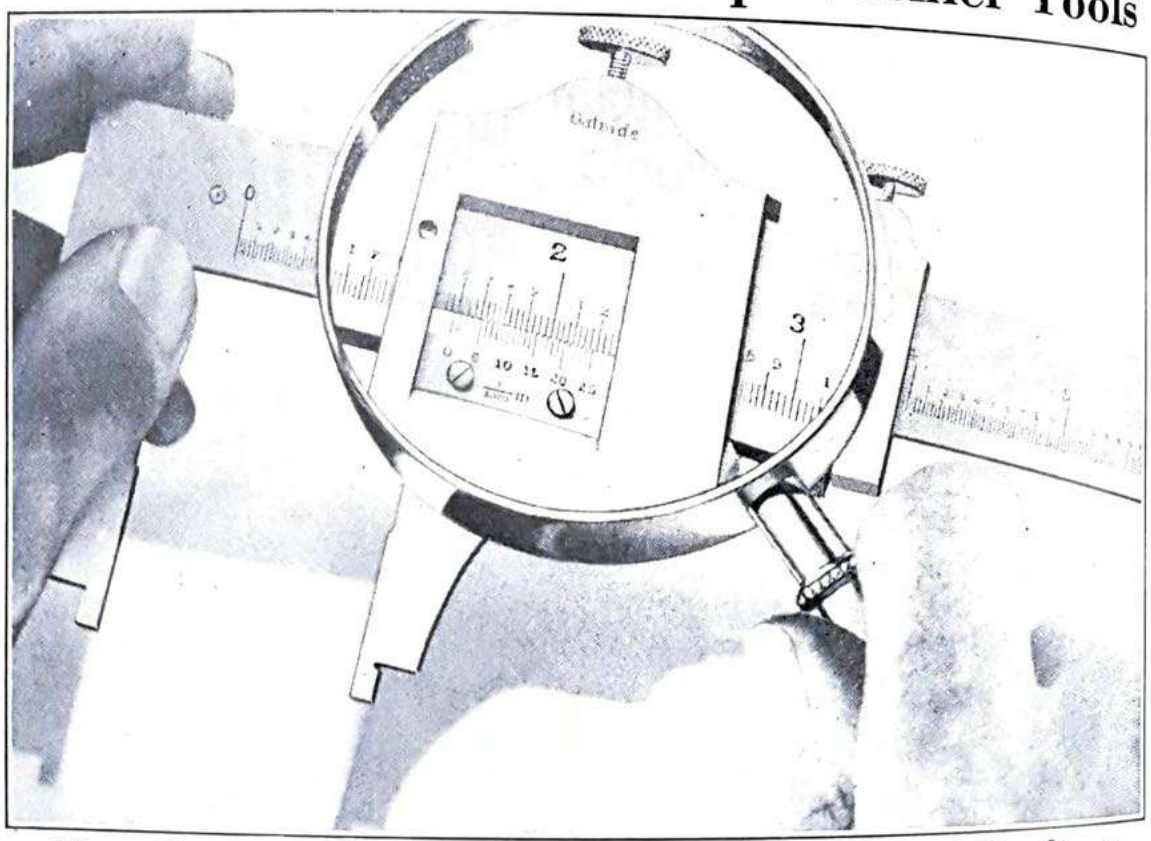
Graduation—One side in half-millimeters, other side in 100ths of an inch.

Each of the above packed one in a box.

Principle of the Vernier

The Vernier was invented by Pierre Vernier in 1631. It consists of a small scale having a certain number of graduations which equals, in combined length, a different number of graduations, usually one more or one less, on the long scale of the tool. It is evident that if, in the same extreme length, the Vernier has divisions greater or less in number by one than the scale, there is a small difference between a division on the Vernier and a division on the scale. The readings depend upon the difference between the Vernier and the scale divisions.

Features of Brown & Sharpe Vernier Tools

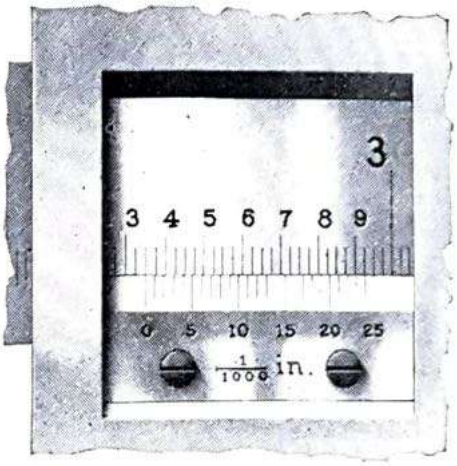


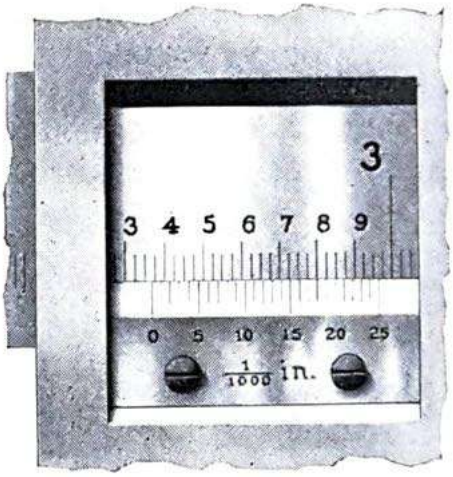
Fine, Clean Cut Lines mean Accurate Settings and Readings

Brown & Sharpe Vernier Tools of all styles have machine-divided graduations which are extremely accurate in their spacing. The lines are cut evenly, not etched, and are narrow and of uniform width and depth. This is essential to the accurate matching of the graduations on the Vernier plate with those on the scale.

Great care is taken in the selection of materials, workmanship, finish and inspection. The Vernier Slides are tightly and smoothly fitted to prevent error at the measuring points. Figures are easily readable, and the hardening and lapping of measuring surfaces are painstakingly performed. No effort is spared to produce tools which will uphold and enhance the outstanding reputation for accuracy, convenience and reliability which Brown & Sharpe Verniers have deservedly enjoyed for generations.

Reading the Vernier—English Measure





Cuts show the Vernier used with a scale which is graduated into 40ths or .025ths of an inch. The Vernier has 25 divisions which are numbered every 5th division and which equal, in extreme length, 24 divisions on the scale, or $24 \times 1/40'' = 24 \times .025'' = .600''$. Thus, one division on the Vernier equals $1/25$ of $.600'' = .024''$. Therefore, the difference between a division on the Vernier and a division on the scale $= .025'' - .024'' = .001''$.

When the reading is exact, with respect to the number of fortieths of an inch, the zero on the Vernier coincides with a graduation on the scale—either inch, tenth or fortieth, as the case may be. This leaves a space between lines on the scale and the 1, 2, 3, 4, 5, 6, etc. lines on the Vernier of .001″, .002″, .003″, .004″, .005″, .006″, etc., respectively, the difference increasing .001″ at each Vernier division in numerical order until, at the 25th graduation, the lines again coincide (see upper cut).

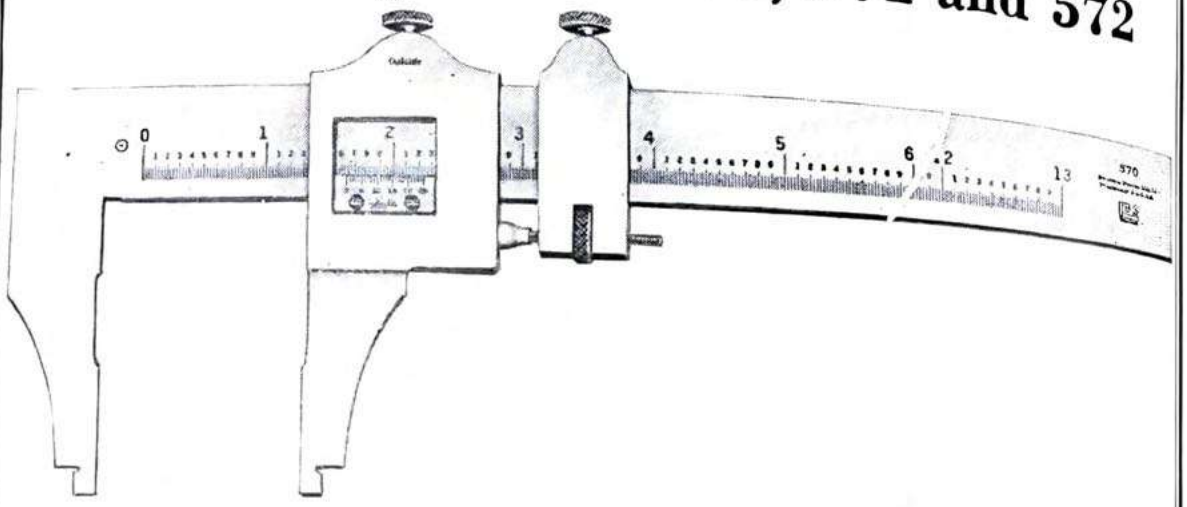
Thus, when the 1st, 2nd or 3rd, etc. line on the Vernier coincides with a line on the scale, the zero on the Vernier has moved 1, 2, or 3, etc. thousandths of an inch past the previous fortieth graduation to bring these lines together.

To read—Note the inches, tenths and fortieths of an inch that the zero on the Vernier has moved from the zero on the scale and to this reading add the number of thousandths indicated by the line on the Vernier that coincides with a line on the scale.

Example:—The upper cut shows the zero graduation on the Vernier coinciding with a fortieth graduation on the scale (the second fortieth beyond an even tenth graduation). This indicates that the reading is exact with respect to the fortieths of an inch. The reading therefore equals $2.000'' + .300'' + .050'' = 2.350''$. The lower cut, however, shows the 18th Vernier graduation coinciding with a line on the scale. This indicates that .018″ should be added to the scale reading. The reading, then, equals $2.000'' + .300'' + .050'' + .018'' = 2.368''$.

Verniers with 25 divisions are used, for English Measure, on all Brown & Sharpe Verniers with the exceptions of Thread Tool Verniers No. 576 and Gear Tooth Verniers No. 580, 20 to 2 diam. pitch, on which Verniers with 20 divisions are used.

Vernier Calipers Nos. 570, 571 and 572



The Vernier Calipers listed on the opposite page (with the exception of No. 572) take inside as well as outside measurements direct. They are graduated to read on one side for outside, and on the other side for inside measurements and the Vernier plate for inside measurements on each tool is set to compensate for thickness of the measuring points of that particular tool. This feature enables the user to read either inside or outside measurements direct from the caliper without calculation.

With the English and Metric Caliper, No. 572, it is necessary to add the following thicknesses of the measuring points to the caliper reading for inside measurements.

Size									
6″ or 150 mm.	Add	.250″	English	Measure	Add	6.35 mm.	Metric	Meas.
12″ " 300 "	"	.300″	"	"	"	7.62 "	"	"
24″ " 600 "	"	.300″	"	"	"	7.62 "	"	"
36″ " 900 "	"	.500″	"	"	"	12.70 "	"	"

The jaws are hardened and ground. Points are placed on the bars and slides so that dividers can be set to transfer distances, except in 36″ and 48″ sizes.

A 1-4″ Standard Internal Cylindrical Gage is furnished when desired, for testing the accuracy of the adjustment of the Caliper. **See page 375 for listing.**

The first and original Vernier Caliper, so far as is known, invented in 1851, by Jos. R. Brown.

Vernier Calipers No. 570

ENGLISH MEASURE

Graduated on both front and back to read, by means of a Vernier, to thousandths of an inch.

No.	Size, Inches	Length of Jaws, Inches	Approximate Width of Jaws Closed, Inches	Price With Case	Price Without Case
570	6	1 1-4	1-4	$26.75	$24.00
	12	2 1-4	3-10	34.00	30.00
	24	2 1-4	3-10	49.00	42.00
	36	2 3-4	1-2	105.00	90.00
	48	3 1-2	3-4	190.00	165.00

570

571

572

Vernier Calipers No. 571

METRIC MEASURE

Graduated on both front and back to read, by means of a Vernier, to 50ths of a millimeter.

No.	Size, mm	Length of Jaws, mm	Approximate Width of Jaws Closed, mm	Price With Case	Price Without Case
571	150	31	6	$26.75	$24.00
	300	57	7 1-2	34.00	30.00
	600	57	7 1-2	49.00	42.00
	900	69	12	105.00	90.00

Vernier Calipers No. 572

ENGLISH AND METRIC MEASURE

This Caliper reads in both English and Metric Measure. Graduated to read in thousandths of an inch on one side and 50ths of a millimeter on the other.

No.	Size		Length of Jaws		Width of Jaws Closed		Price With Case	Price Without Case
	Inches	mm	Inches	mm	Inches	mm		
572	6	150	1 1-4	31	.250	6.35	$26.75	$24.00
	12	300	2 1-4	57	.300	7.62	34.00	30.00
	24	600	2 1-4	57	.300	7.62	49.00	42.00
	36	900	2 3-4	69	.500	12.70	105.00	90.00

All Vernier Calipers listed on this page are furnished in cases, unless otherwise ordered.

Each of the above packed one in a box.

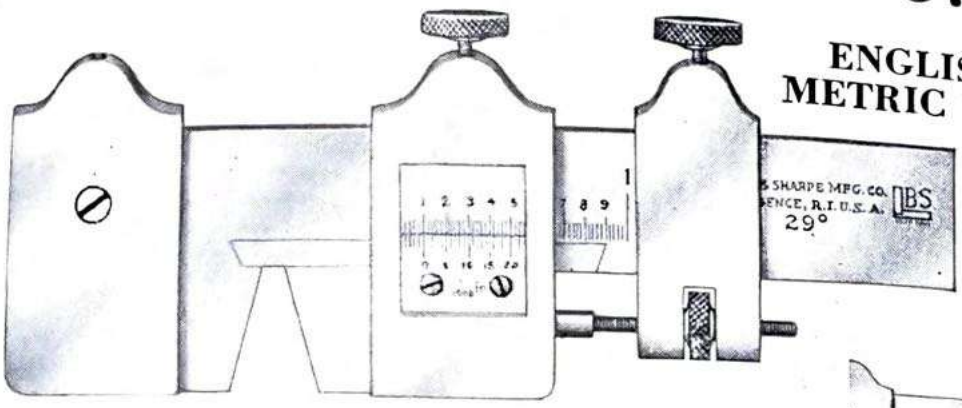
Larger sizes of any of the above furnished on order.

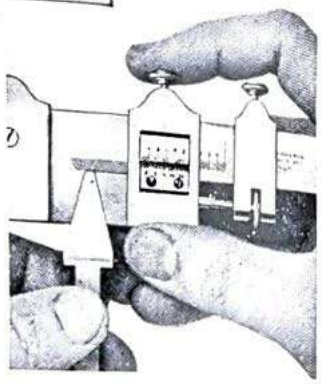
Prices on application.

Thread Tool Verniers No. 576

576

577





60° Thread Tool Vernier, in Case, $26.75
55° Thread Tool Vernier, in Case, 26.75
29° Thread Tool Vernier, in Case, 26.75

Price, without Case, **$25.00**

Furnished in case unless otherwise ordered.

For measuring thread tools. Sliding jaw is set for width of point of tool of required pitch. Thread tool is then ground so that point bottoms on hardened steel strip in blade and sides rest against jaws of tool. Jaws are hardened and ground, angles being tested for accuracy. Vernier reads in thousandths of an inch on one side of tool and in 50ths of a millimeter on the other. Graduated for one inch and twenty-five millimeters on respective sides.

Thread Tool Gages No. 577

60° Worm Thread Tool Gage, $7.50
55° Worm Thread Tool Gage, 7.50
29° Worm Thread Tool Gage, 7.50

Case, **$1.75**

Can be set by inserting plug gage or thickness gage blade in opening on top. Sliding jaw is clamped by knurled screw and set for width of point or flat of tool for required pitch. Thread tool is then ground until point bottoms and sides rest against jaws of tool. Jaws are hardened and ground, angles being carefully tested. These gages cover all pitches.

Each of the above packed one in a box.

Gear Tooth Verniers Nos. 580 and 581

No. 580
ENGLISH MEASURE

Reads to thousandths of an inch

20 diametral to 2 diametral pitch

Price, in Case $42.75
Price, without Case 40.00

10 diametral to 1 diametral pitch

Price, in Wooden Case . . $63.00
Price, without Case 60.00

No. 581
METRIC MEASURE

Reads to fiftieths of a millimeter

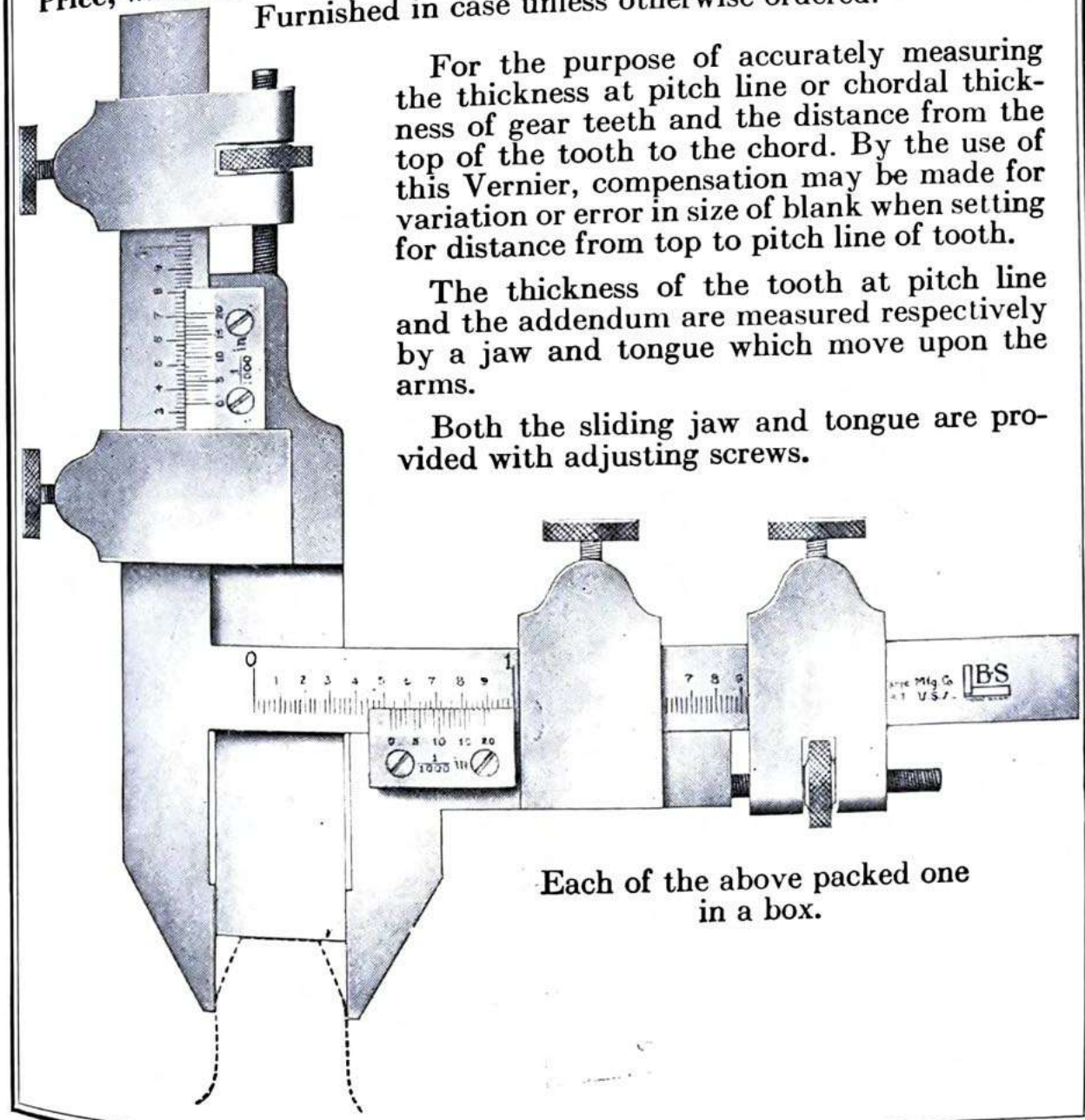
1 1-4 mm to 12 mm module

Price, in Case $42.75
Price, without Case 40.00 580

2 1-2 mm to 25 mm module

Price, in Wooden Case . . $63.00 581
Price, without Case 60.00

Furnished in case unless otherwise ordered.



For the purpose of accurately measuring the thickness at pitch line or chordal thickness of gear teeth and the distance from the top of the tooth to the chord. By the use of this Vernier, compensation may be made for variation or error in size of blank when setting for distance from top to pitch line of tooth.

The thickness of the tooth at pitch line and the addendum are measured respectively by a jaw and tongue which move upon the arms.

Both the sliding jaw and tongue are provided with adjusting screws.

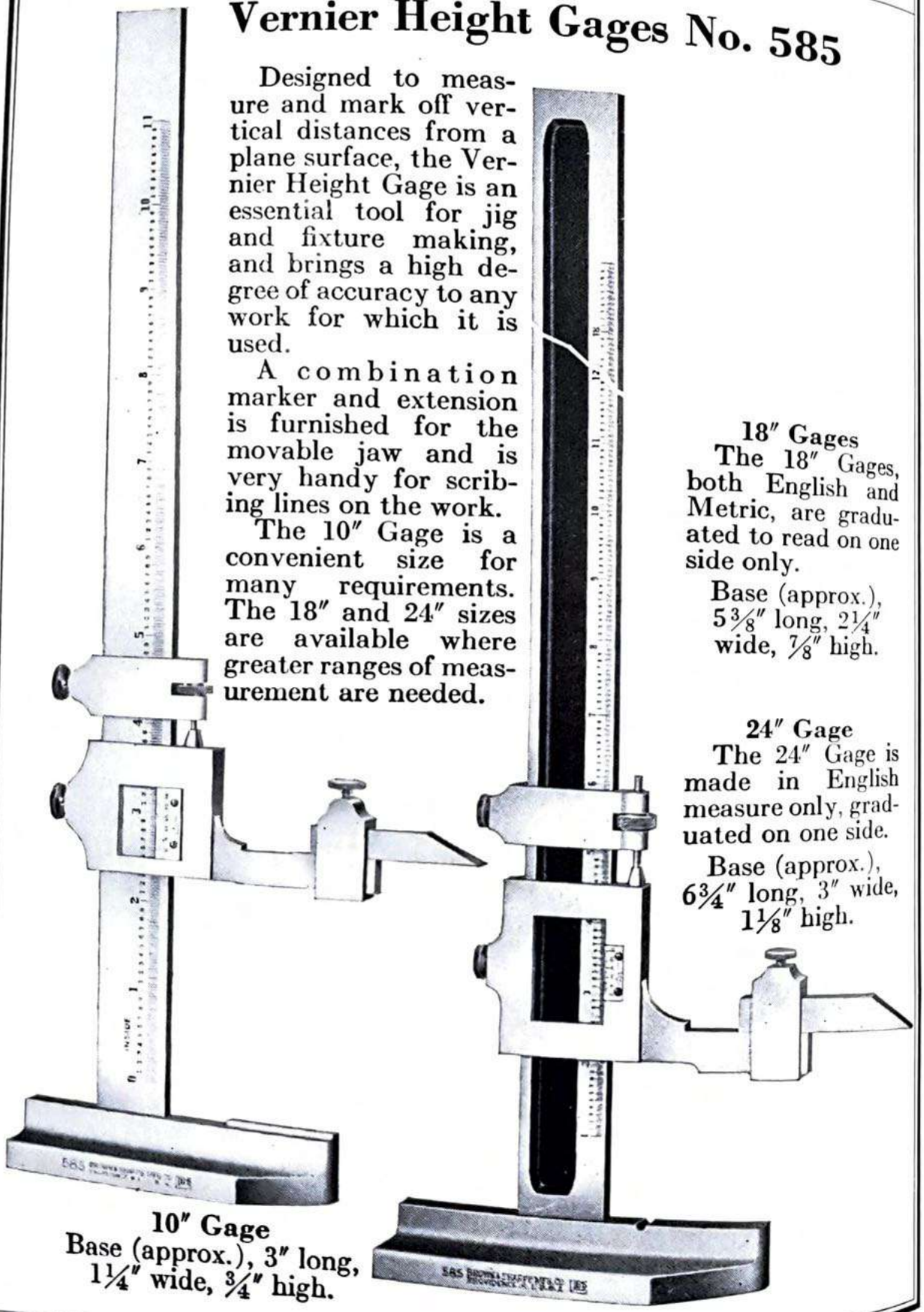
Each of the above packed one in a box.

Vernier Height Gages No. 585

Designed to measure and mark off vertical distances from a plane surface, the Vernier Height Gage is an essential tool for jig and fixture making, and brings a high degree of accuracy to any work for which it is used.

A combination marker and extension is furnished for the movable jaw and is very handy for scribing lines on the work.

The 10″ Gage is a convenient size for many requirements. The 18″ and 24″ sizes are available where greater ranges of measurement are needed.



18″ Gages
The 18″ Gages, both English and Metric, are graduated to read on one side only.

Base (approx.), 5⅜″ long, 2¼″ wide, ⅞″ high.

24″ Gage
The 24″ Gage is made in English measure only, graduated on one side.

Base (approx.), 6¾″ long, 3″ wide, 1⅛″ high.

10″ Gage
Base (approx.), 3″ long, 1¼″ wide, ¾″ high.

Vernier Height Gages No. 585

10″ Height Gage

Price, in Case.....**$45.00** **Price,** without Case.....**$40.00**

Furnished in Case unless otherwise ordered.

Base is ground and lapped on the top and bottom. Measurements may be taken on both inside and outside of the jaws. 585

English Measure. One side is for use as height gage from 1⅛″ to 10″, and the other side as an outside caliper from 0 to 10″. Both measurements are read directly in thousandths of an inch.

Metric Measure. One side is for use as height gage from 28 mm to 25 cm, and the other side as an outside caliper from 0 to 25 cm. Both measurements are read directly in 50ths of a millimeter.

English and Metric Measure. One side is for use as a height gage, English Measure, from 1⅛″ to 10″ by thousandths of an inch, and the other side for use as a height gage, Metric Measure, from 28 mm to 25 cm by 50ths of a millimeter. Height gage measurements are read direct.

This tool can also be used as an outside caliper. Measurements between the jaws are determined by deducting from the reading the thickness of the jaw and base. This thickness can be ascertained by bringing jaw and base to closed position and noting reading of tool at that point.

18″ Height Gage

Price, in Case.....**$97.50** **Price,** without Case.....**$90.00**

Furnished in Case unless otherwise ordered.

Designed for use as height gage only. Base has no finished surface on the top.

English Measure. Graduated on one side only to read from 1½″ to 18″ by thousandths of an inch.

Metric Measure. Graduated on one side only to read from 40 mm to 46 cm by 50ths of a millimeter.

English and Metric Measure. Graduated to read on one side from 1½″ to 18″ by thousandths of an inch, and on the other, from 40 mm to 46 cm by 50ths of a millimeter.

24″ Height Gage

Price, with Wooden Case, **$180.00** **Price,** without Case....**$170.00**

Furnished in Case unless otherwise ordered.

Designed for use as height gage only. Base has no finished surface on the top.

English Measure. Graduated on one side only to read from 1⅞″ to 24″ by thousandths of an inch.

Each of the above packed one in a box.

Larger sizes furnished on order. Prices on application.

Depth Gage Attachments Nos. 585A and 585B

For Use on
Brown & Sharpe Vernier Height Gages

585 A

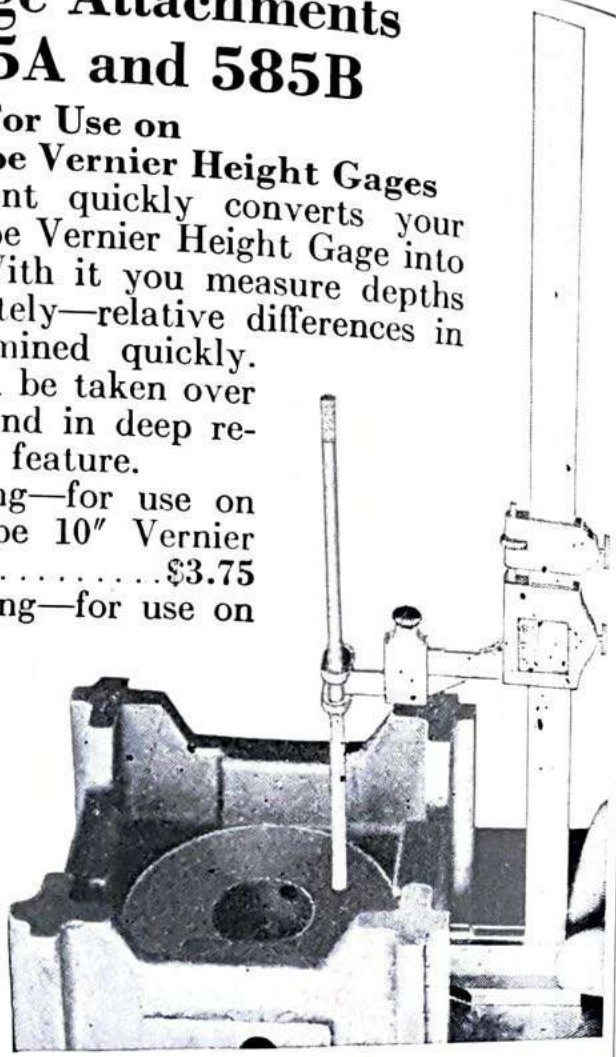
585 B

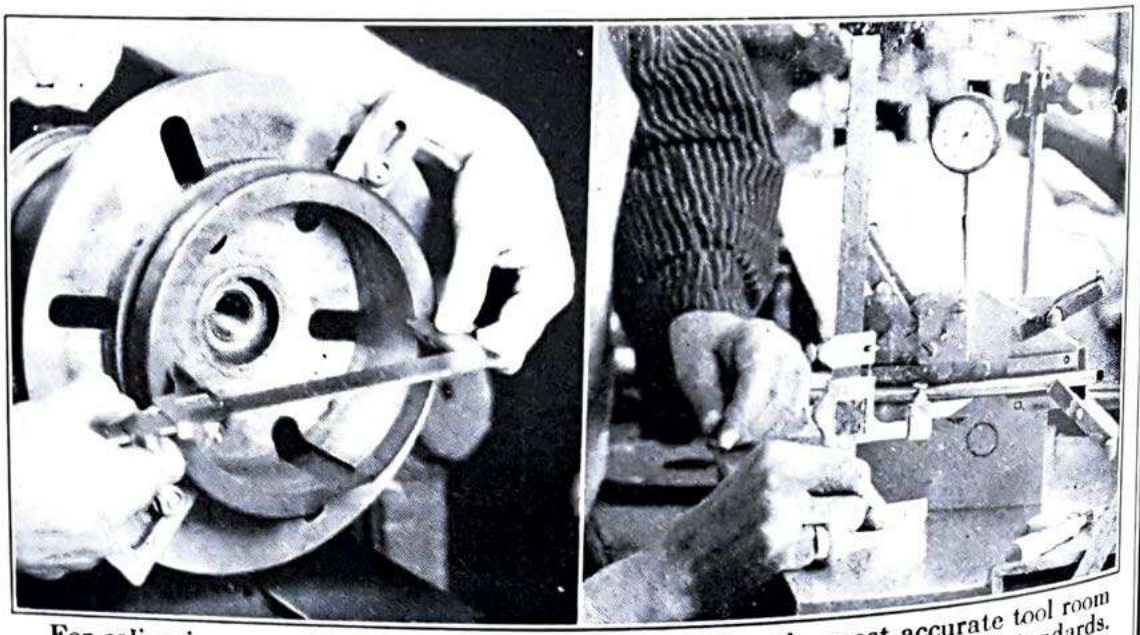
THIS Attachment quickly converts your Brown & Sharpe Vernier Height Gage into a Depth Gage. With it you measure depths easily and accurately—relative differences in height are determined quickly. Measurements can be taken over high projections and in deep recesses—a desirable feature.

No. 585A—7″ long—for use on Brown & Sharpe 10″ Vernier Height Gages.....**$3.75**

No. 585B—10″ long—for use on Brown & Sharpe 18″ and 24″ Vernier Height Gages.....**$6.00**

Each of the above packed one in a box.

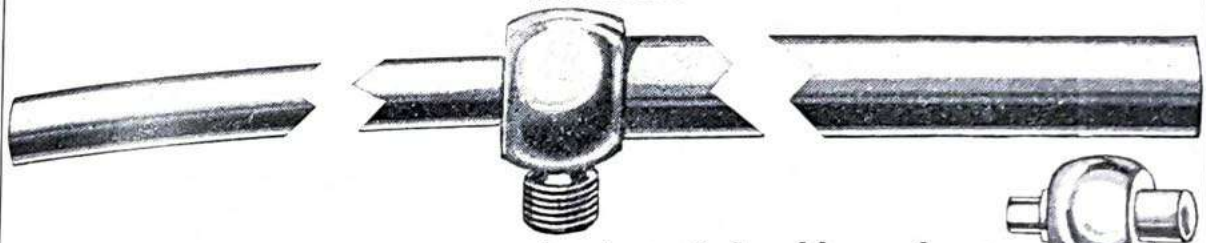




For calipering exact inside diameters, or for inspecting the most accurate tool room work, Brown & Sharpe Verniers and Height Gages help maintain the highest standards.

Telescoping Gages No. 590

Patented



590

590 A

590 B

590 C

590 D

590 E

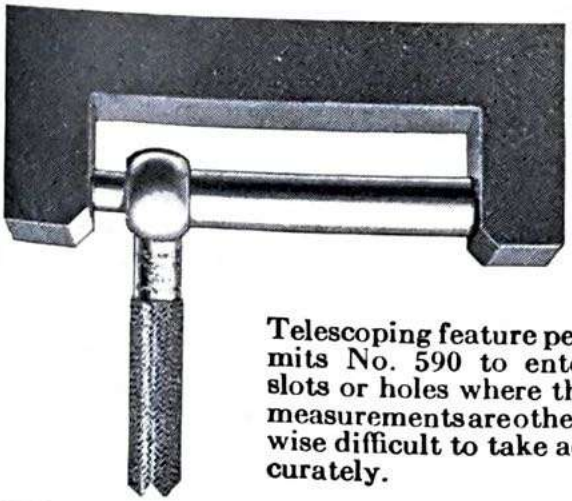
590 F

THESE gages are compact, simple and durable, and are intended for use with a micrometer caliper to determine quickly internal measurements which are otherwise hard to obtain. The Brown & Sharpe design incorporates two important features. 1. Only the small leg telescopes. This brings handle near to point of contact in the most sensitive position for accurate measurement. (See illustration below at left.) 2. When handle is removed, heads will not fly apart and become lost. Ends of each head are hardened and faces are ground on radius of smallest hole gage will enter, thus adapting tool, especially for accurate use on curved surfaces. The five heads are interchangeable.

In use, head expands to exact size of hole and is then locked by turn of knurled screw in end of handle. Gage is withdrawn and measured with micrometer.

	Price
No. 590, Complete Set, Range ½″ to 6″ (including handle)	**$12.00**
No. 590A—Handle	**.50**
No. 590B—Range, ½″ to ¾″ (without handle)	**2.00**
No. 590C—Range, ¾″ to 1¼″ (without handle)	**2.00**
No. 590D—Range, 1¼″ to 2⅛″ (without handle)	**2.50**
No. 590E—Range, 2⅛″ to 3½″ (without handle)	**2.50**
No. 590F—Range, 3½″ to 6″ (without handle)	**3.00**

Unless otherwise ordered, complete set will be furnished. Each of the above packed one in a box.



Telescoping feature permits No. 590 to enter slots or holes where the measurements are otherwise difficult to take accurately.

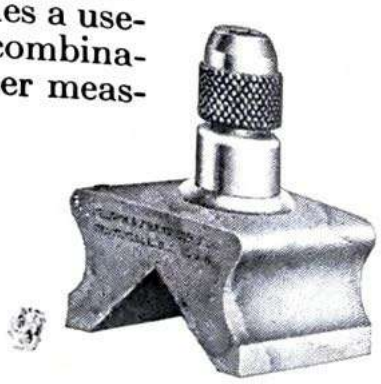
Height Gage Attachment No. 598

For Use with Inside Micrometers Nos. 260 and 261
Price, $2.50

598

599

In conjunction with an inside micrometer, this attachment makes a useful, accurate and economical combination. The end of the micrometer measuring rod is first lined up with the base of the attachment, the chuck is tightened, and the tool is ready for use. The V groove adapts it for use on cylindrical work. It is convenient not only as a height gage but for many other measurements as well.

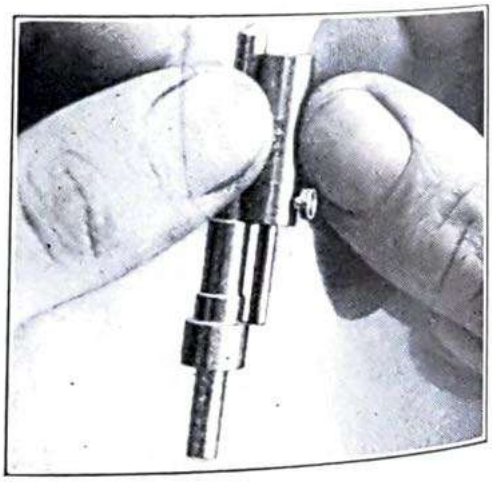


Depth Gage No. 599

Range, 0 to 2″
Price, $1.75
Price includes four Measuring Rods.

This is a handy all-around tool used in conjunction with an outside micrometer caliper, for checking depths from 0 to 2″. Readings are obtained by measuring overall length of body and exposed portion of rod and subtracting one inch, the length of the body. Useful for measuring distances between shoulders, flanges, etc. In such uses, the overall length of the tool, 1″ to 3″ is used.

Body is hardened and ground, and rods are polished.



Each of the above packed one in a box.

Vernier Depth Gage No. 600

ENGLISH, METRIC, OR ENGLISH AND METRIC MEASURE

600

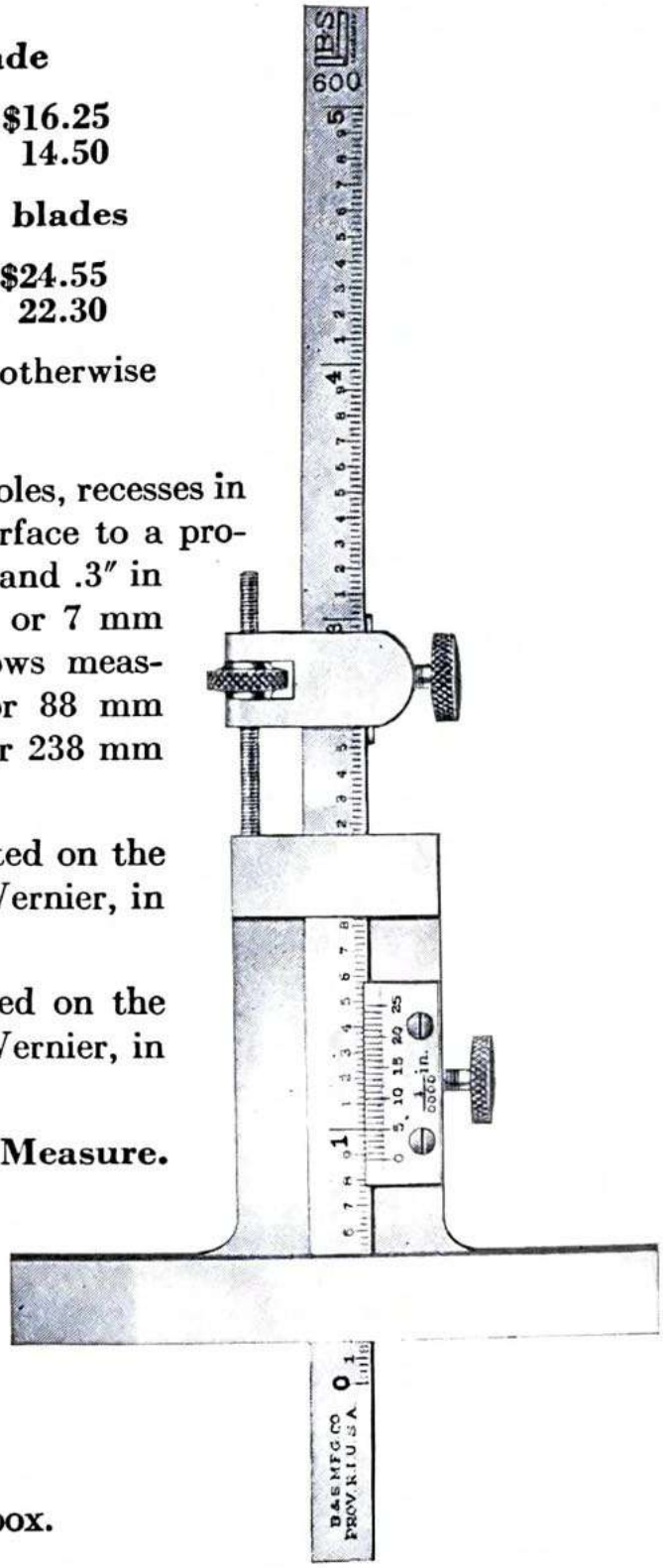
Gage with 6″ blade

Price	In Case,	$16.25
	Without Case,	14.50

Gage with 6″ and 12″ blades

Price	In Case,	$24.55
	Without Case,	22.30

Furnished in case unless otherwise ordered.



For obtaining the depth of holes, recesses in dies, distance from a plane surface to a projection, etc. Base is 2⅝″ wide and .3″ in thickness. The blades are ¼″ or 7 mm wide. The six-inch blade allows measurements to be made 3½″ or 88 mm deep and the 12″ blade 9½″ or 238 mm deep.

English Measure. Graduated on the front to read, by means of a Vernier, in thousandths of an inch.

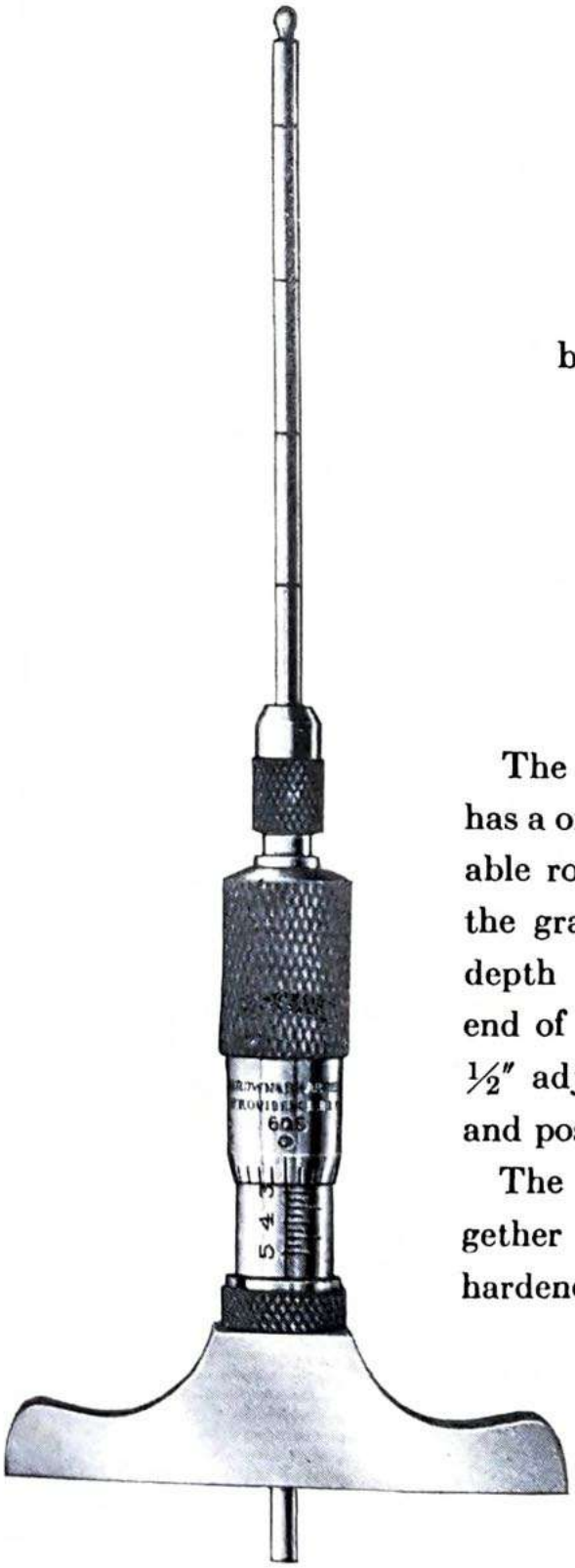
Metric Measure. Graduated on the front to read, by means of a Vernier, in 50ths of a millimeter.

English and Metric Measure. Graduated on the front to read, by means of Verniers, in thousandths of an inch on one corner, and in 50ths of a millimeter on the other.

Packed one in a box.

Micrometer Depth Gage No. 605

605



ENGLISH MEASURE
Range, 0 to 2 1-2″
by thousandths of an inch

METRIC MEASURE
Range, 0 to 63 mm
by hundredths of a millimeter

2″ Base, Price, $8.75
Case, **$1.25**
4″ Base, Price, $9.50
Case, **$2.00**

The micrometer screw in these gages has a one half inch movement. The adjustable rod is graduated each half-inch and the graduations are of such a form and depth that the clamping fingers, at the end of the gage, spring in, and allow the ½″ adjustment of the rod to be quickly and positively made.

The base is about 7/16″ thick and, together with the point of the rod, is hardened.

Packed one in a box.

Micrometer Depth Gages Nos. 607 and 607RS

ENGLISH MEASURE
Range, 0 to 3″
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 75 mm
by hundredths of a millimeter

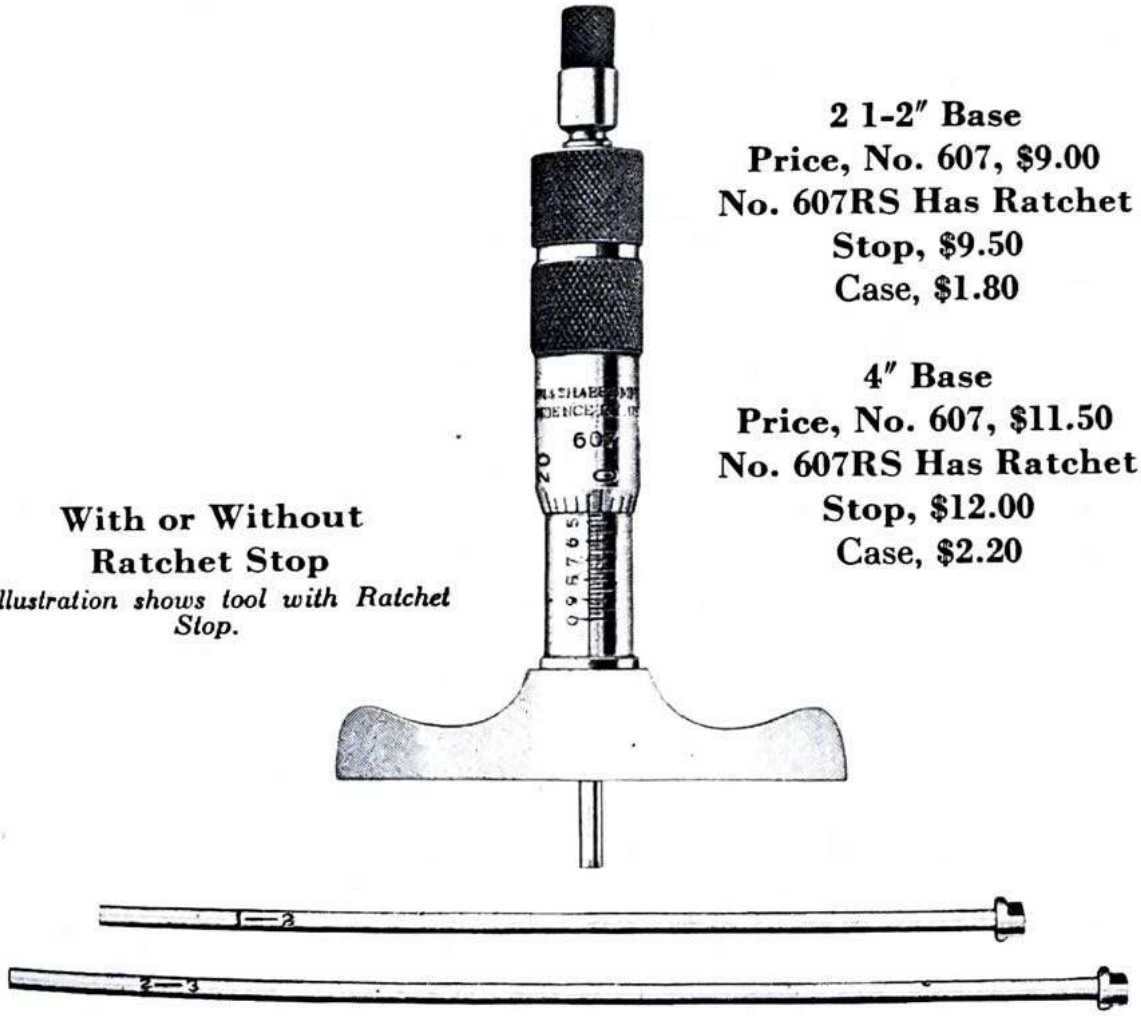
607

607 RS

2 1-2″ Base
Price, No. 607, $9.00
No. 607RS Has Ratchet Stop, $9.50
Case, $1.80

4″ Base
Price, No. 607, $11.50
No. 607RS Has Ratchet Stop, $12.00
Case, $2.20

With or Without Ratchet Stop
Illustration shows tool with Ratchet Stop.



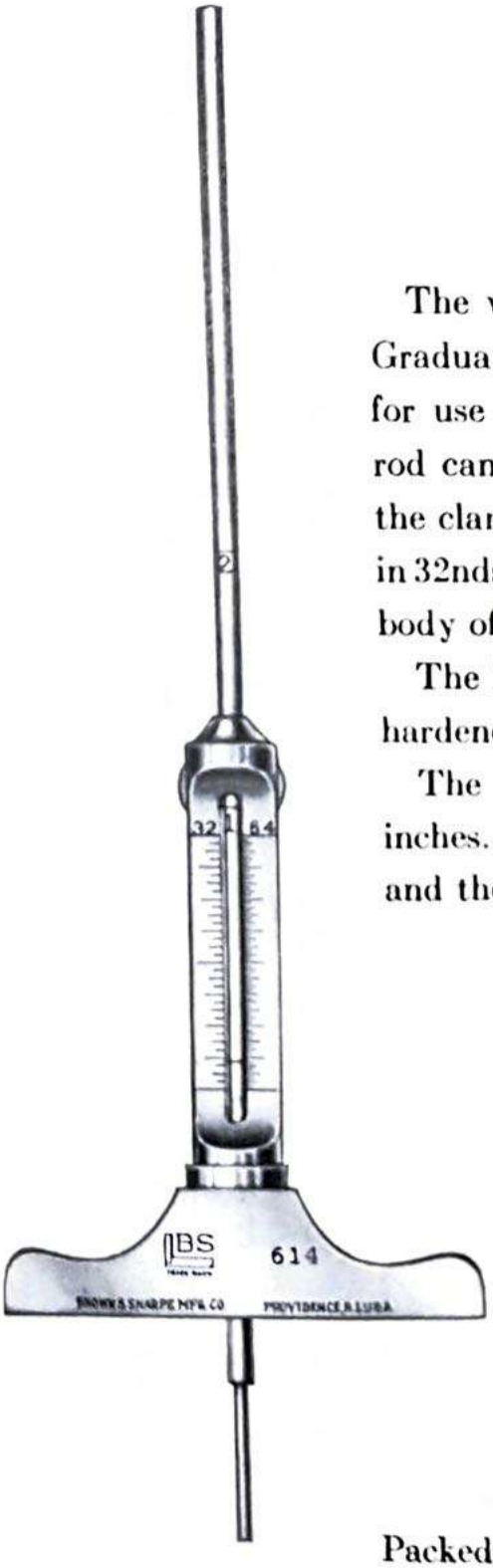
The Micrometer Screw has a movement of 1″ and the range from 0 to 3″ is obtained by the use of the three measuring rods furnished. Ends of rods are hardened. The rod desired is easily and quickly inserted in the Gage through a hole in the Micrometer Screw. Bases are about 9/16″ thick and hardened.

The rods measure from 0 to 1″, 1″ to 2″ and 2″ to 3″ English Measure, or 0 to 25 mm, 25 mm to 50 mm and 50 mm to 75 mm, Metric Measure.

Packed one in a box.

Graduated Rod Depth Gage No. 614

614

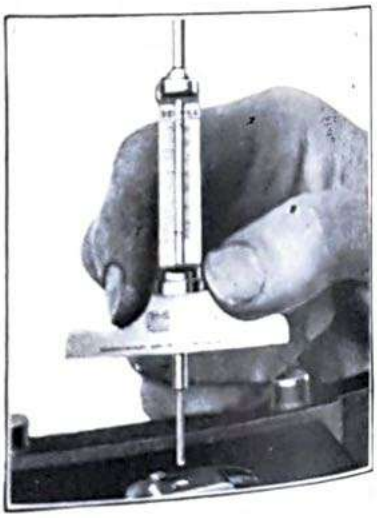


Range, 0 to 3″
Price, $4.50

The wide base and slender rod make this Graduated Rod Depth Gage very convenient for use in large as well as small holes. The rod can be securely locked at any depth by the clamp screw and the depth is read direct in 32nds and 64ths of an inch on the graduated body of the gage.

The base is about 2″ wide, ¼″ thick and is hardened and ground.

The rod is graduated each inch for three inches. The first ⅝″ of rod is 1/16″ diameter and the remainder is ⅛″ diameter.



Packed one in a box.

Rule Depth Gage No. 615

ENGLISH MEASURE
Range, 0 to 3″ or 0 to 5″

METRIC MEASURE
Range, 0 to 75 mm or 0 to 125 mm

Price	**With 4″ blade only,**	**$1.35**
	With 4″ blade and 4″ rod,	**1.55**
	With 6″ blade only,	**1.50**
	With 6″ blade and 6″ rod,	**1.70**

Furnished with rod unless otherwise ordered.

The head of this Rule Depth Gage is made of hardened steel, 2½″ wide and ⅛″ thick, and is of a form especially designed for convenience in measuring.

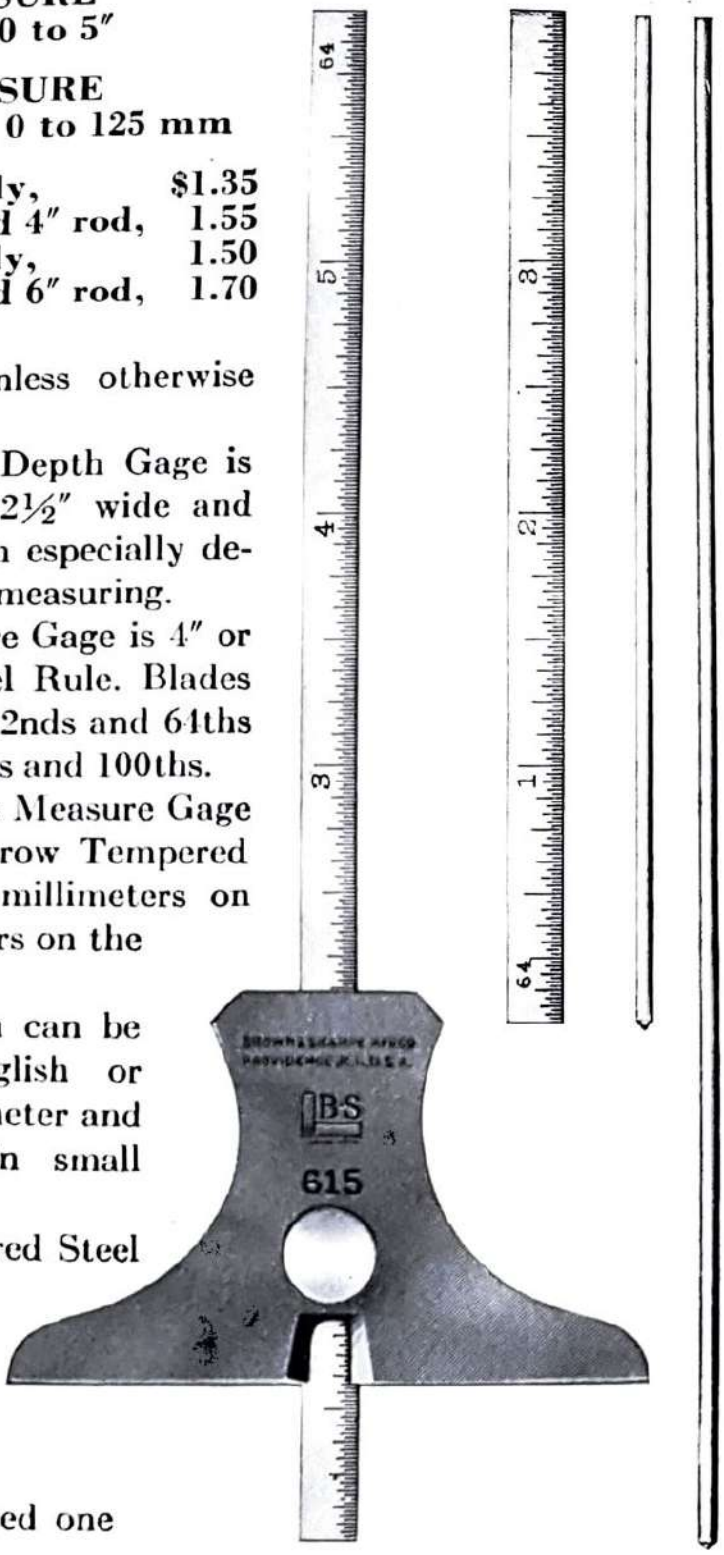
Blade of English Measure Gage is 4″ or 6″ Narrow Tempered Steel Rule. Blades have No. 10 Graduation, 32nds and 64ths or No. 11 Graduation, 64ths and 100ths.

The blade of the Metric Measure Gage is a 10 cm or 15 cm Narrow Tempered Steel Rule graduated in millimeters on one side and half-millimeters on the other.

The 4″ or 6″ rod which can be furnished with the English or Metric Gages is 5/64″ in diameter and is convenient for use in small holes.

4″ or 6″ Narrow Tempered Steel Rules No. 303 or 4″ or 6″ Narrow Tempered Hook Rules No. 325 can be used with this gage, if desired.

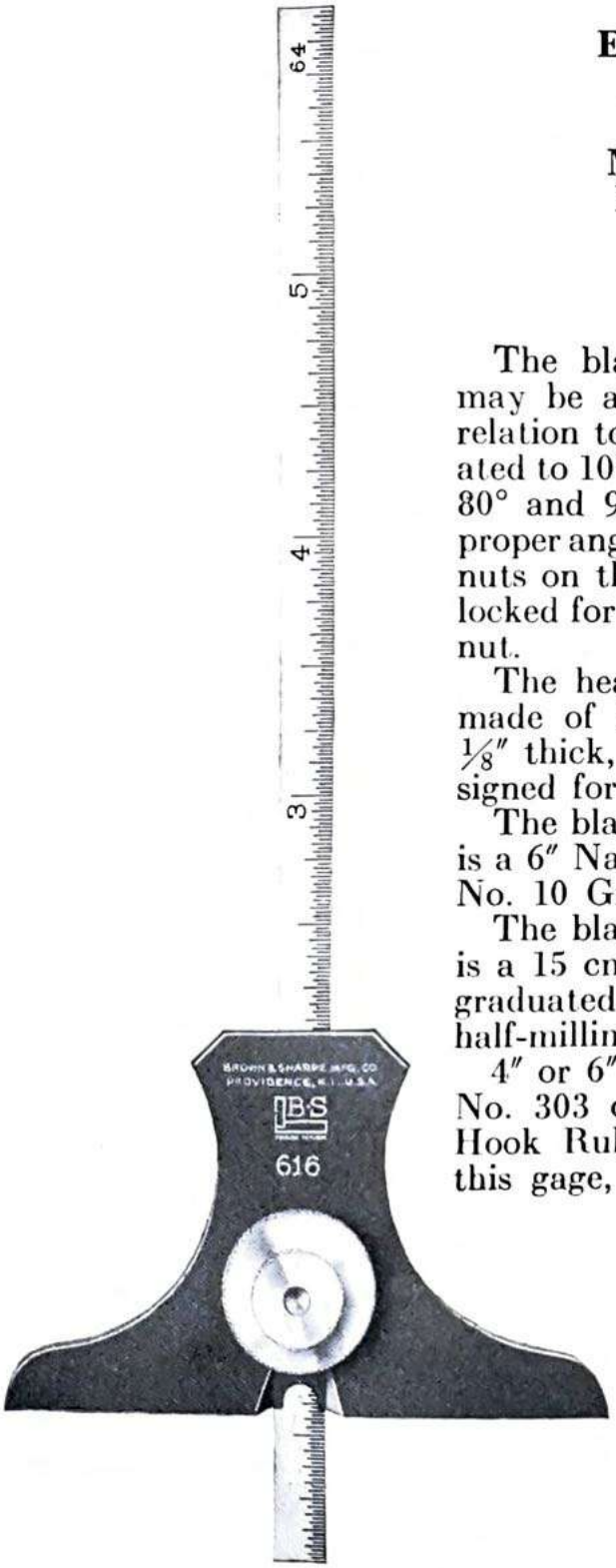
Each of the above packed one in a box.



615

Rule Depth Gage No. 616

616



ENGLISH MEASURE
Range, 0 to 5″

METRIC MEASURE
Range, 0 to 125 mm

Price, $2.25

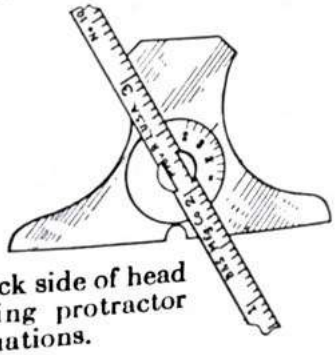
The blade of this Rule Depth Gage may be adjusted easily to any angle in relation to the head. The turret is graduated to 10°, 20°, 30°, 40°, 45°, 50°, 60°, 70°, 80° and 90°. The blade is locked at the proper angle by the larger of the two clamp nuts on the front side of the head and is locked for any depth by the smaller clamp nut.

The head of this Rule Depth Gage is made of hardened steel, 2½″ wide and ⅛″ thick, and is of a form especially designed for convenience in measuring.

The blade of the English Measure gage is a 6″ Narrow Tempered Steel Rule with No. 10 Graduation, 32nds and 64ths.

The blade of the Metric Measure gage is a 15 cm Narrow Tempered Steel Rule graduated in millimeters on one side and in half-millimeters on the other.

4″ or 6″ Narrow Tempered Steel Rules No. 303 or 4″ or 6″ Narrow Tempered Hook Rules No. 325 can be used with this gage, if desired.



Back side of head showing protractor graduations.

Packed one in a box.

Drill Point Gage and Depth Gage No. 617

ENGLISH MEASURE
Range, 0 to 5″

METRIC MEASURE
Range, 0 to 125 mm

Price { With blade only **$2.20**
With blade and rod **2.40**

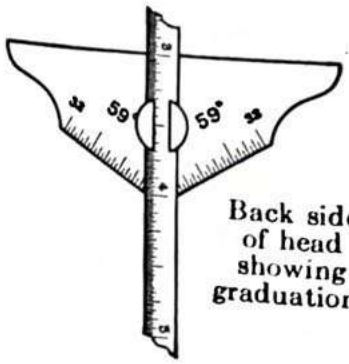
Furnished with rod unless otherwise ordered.

This tool can be used for checking the angles of drill points when grinding them and determines whether the point is central, and it may be used as a depth gage for finding the depths of holes as small as 3/32″ diameter.

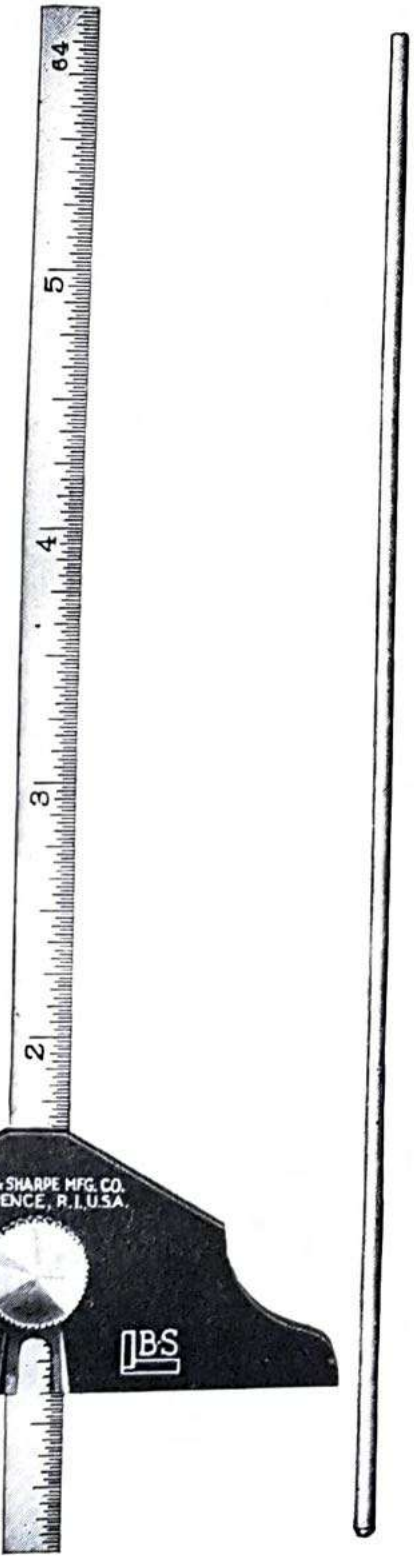
The head is of hardened steel, 2½″ wide and ⅛″ thick. The top of the head is carefully ground to angles of 59° on each side of the blade and is accurately graduated.

Blade of English Measure Gage is 6″ long, 7/32″ wide, with No. 10 graduation, 32nds and 64ths of an inch. Blade of Metric Measure Gage is 15 cm long and is graduated in millimeters on one side and half-millimeters on the other.

The 6″ rod which can be furnished with the English or Metric Gages is 5/64″ in diameter and is convenient for use in small holes.



Back side of head showing graduations.



617

Each of the above packed one in a box.

Universal Surface Gages Nos. 620, 621 and 622

OUR line of Surface Gages has been so designed that a wide range of adjustments can be made readily by means of the knurled adjusting screw.

The spindle and the bolt and bushing through which it passes are locked in the position of approximate adjustment by the knurled nut at the boss on the base. The fine adjustment can then be used to obtain the exact setting.

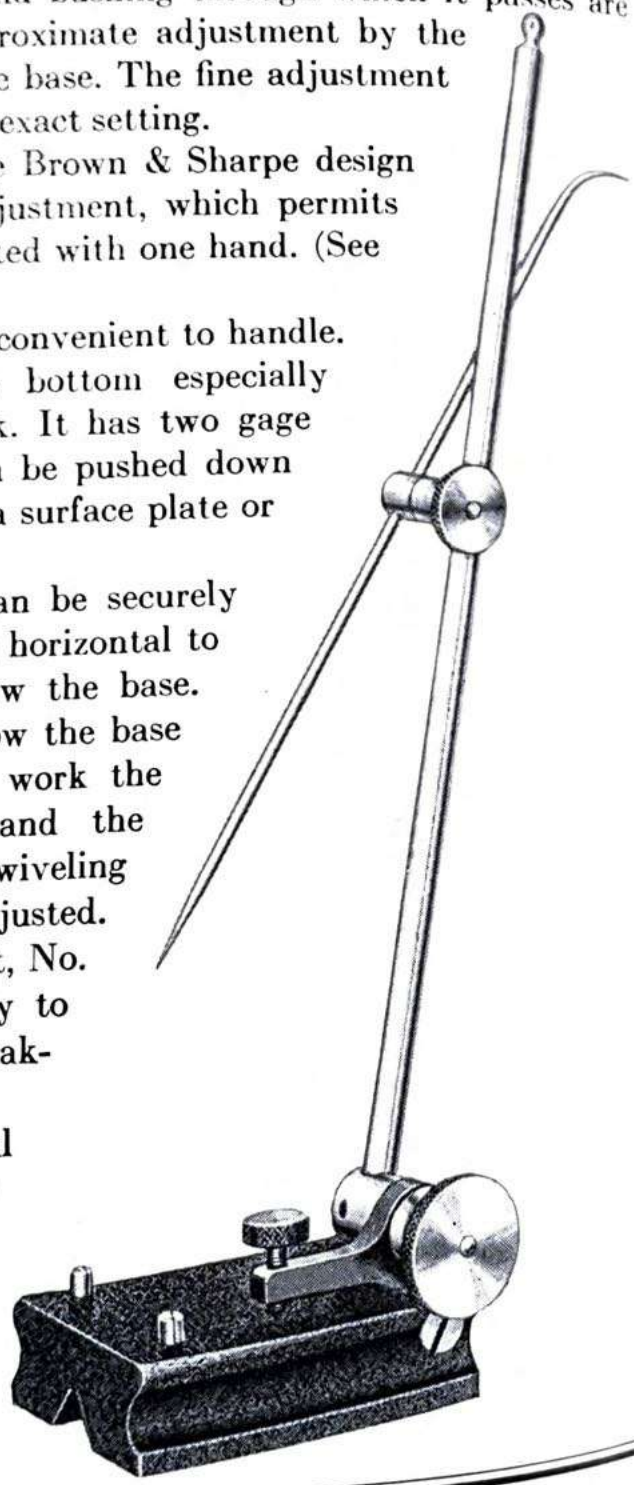
A distinct advantage of the Brown & Sharpe design is the location of the fine adjustment, which permits the gage to be held and adjusted with one hand. (See illustration on page 362.)

The base is of a form most convenient to handle. A V-shaped groove in the bottom especially adapts it for cylindrical work. It has two gage pins in the rear end that can be pushed down and used against the edge of a surface plate or the side of a T-slot.

The spindle swivels and can be securely clamped in any position from horizontal to vertical either above or below the base. The scriber may be used below the base as a depth gage. For small work the spindle may be removed and the scriber inserted in the spindle swiveling bolt where it is readily adjusted.

With the Pencil Attachment, No. 622 becomes especially handy to patternmakers and cabinetmakers, etc.

No. 621 Gages and Universal Dial Indicator Set No. 740 make a very useful combination. Swivel of No. 740 Set fits spindles of No. 621. (See illustration page 417.)



Universal Surface Gages No. 620

No.		Price
620A	With 4″ Spindle, Base Not Hardened	$3.50
620B	With 4″ Spindle, Base Hardened	4.10

Size of Base, approximately 2¼″ x 1½″

Universal Surface Gages No. 621

No.		Price
621A	With 9″ Spindle, Base Not Hardened	$3.50
621B	With 9″ and 12″ Spindles, Base Not Hardened	4.00
621C	With 9″ Spindle, Base Hardened	4.75
621D	With 9″ and 12″ Spindles, Base Hardened	5.25

Size of Base, approximately 3⅛″ x 2½″

Universal Surface Gages No. 622

Heavy Base

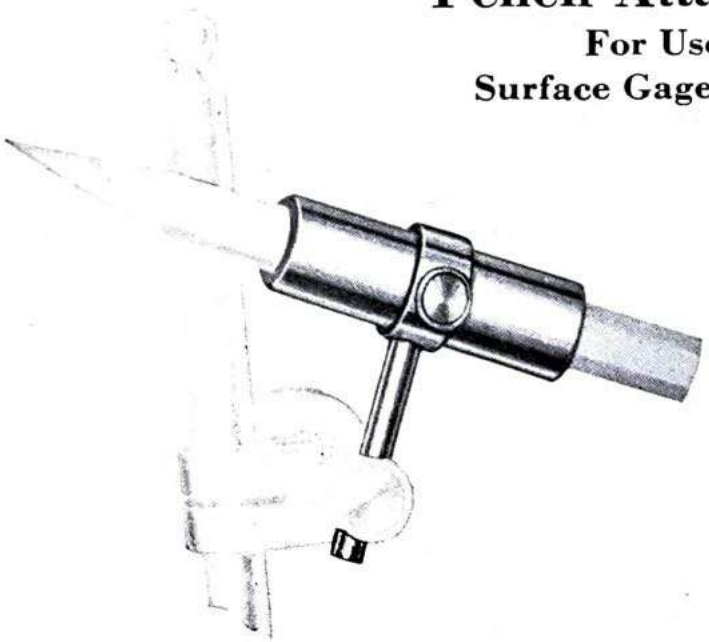
No.		Price
622A	With 12″ Spindle, Base Not Hardened	$4.85
622B	With 12″ and 18″ Spindles, Base Not Hardened	5.50
622C	With 12″ Spindle, Base Hardened	5.85
622D	With 12″ and 18″ Spindles, Base Hardened	6.50

Size of Base, approximately 4″ x 3⅜″

Each of the above packed one in a box.

Pencil Attachment

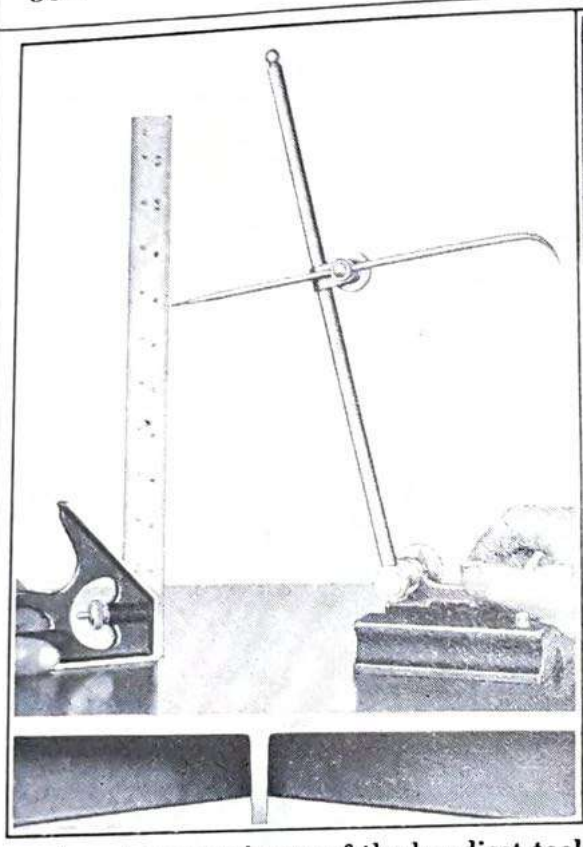
For Use on
Surface Gages No. 622



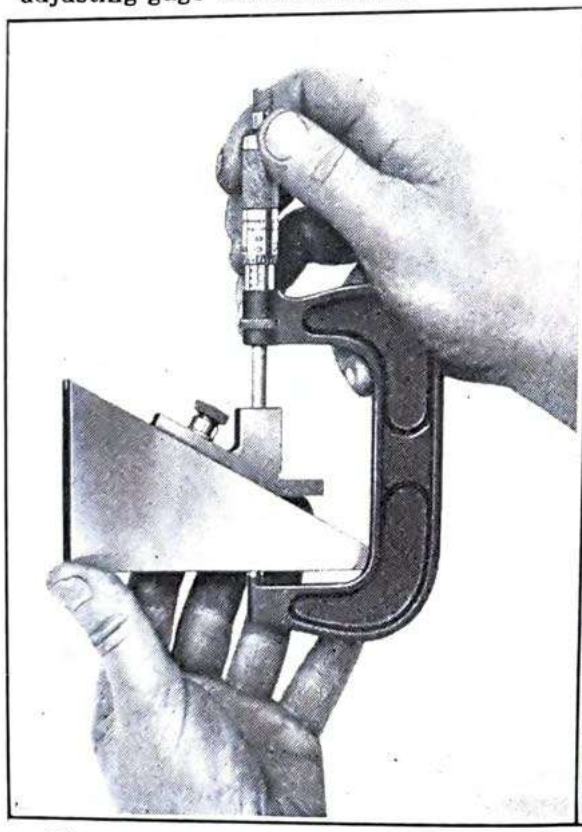
Price, 75 cents

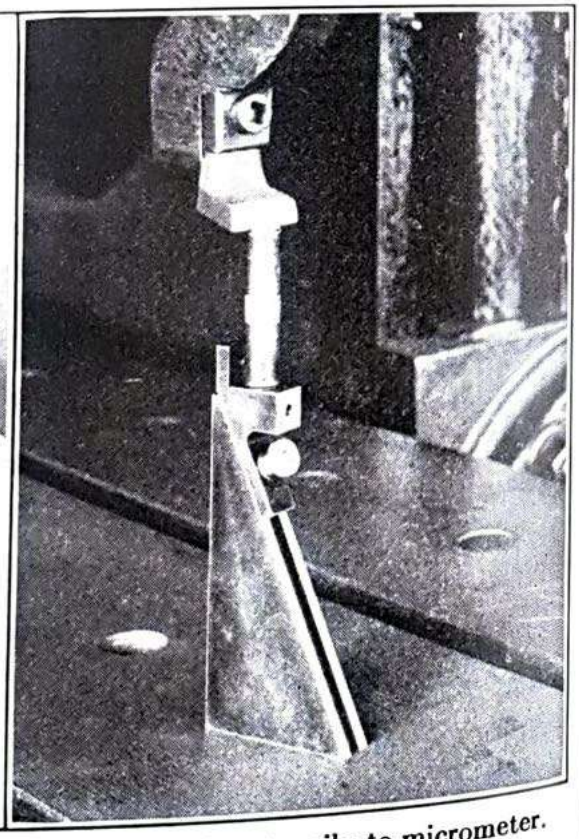
This attachment is handy where pencil instead of scribed line is desired. Very useful to patternmakers, cabinetmakers, etc.

Packed one in a box.



A surface gage is one of the handiest tools. At left, note convenience of holding and adjusting gage with one hand.



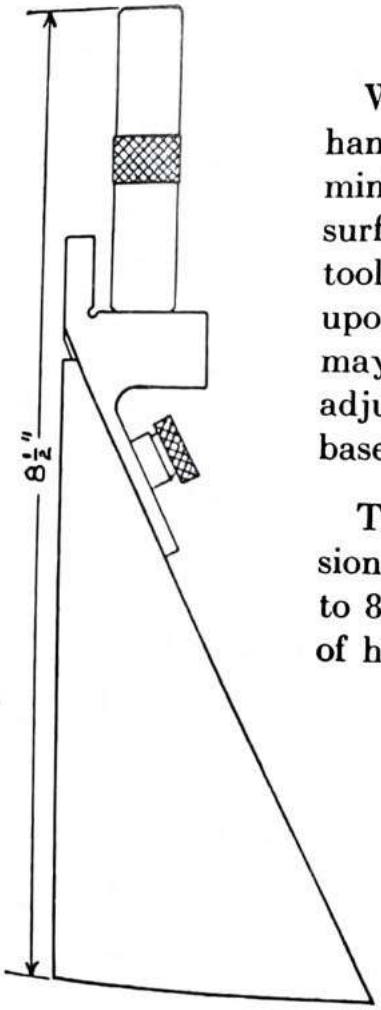


No. 625 gives a range of settings from ¼″ to 8½″. Gage is set easily to micrometer.

Planer and Shaper Gage No. 625

625

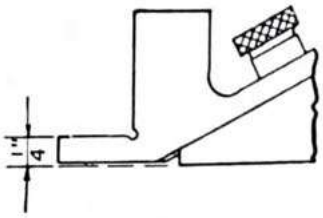
Price, $4.75



With this gage the time spent by the planer hand in adjusting the cutting tool is reduced to a minimum. By setting the gage to a micrometer, surface gage or caliper and bringing the planer tool in contact with it, the first cut may be relied upon to give the desired dimension. This gage may be used on its side as the diameter of the adjusting nut is less than the thickness of the base.

The slide is so designed that with one extension it is possible to get a tool setting from ¼" to 8½". The base, slide and extension are made of high quality steel hardened and ground

Packed one in a box.



Planer and Shaper Gage No. 625 can be set from 8½" to ¼" in height.

Fillet and Radius Gages No. 627

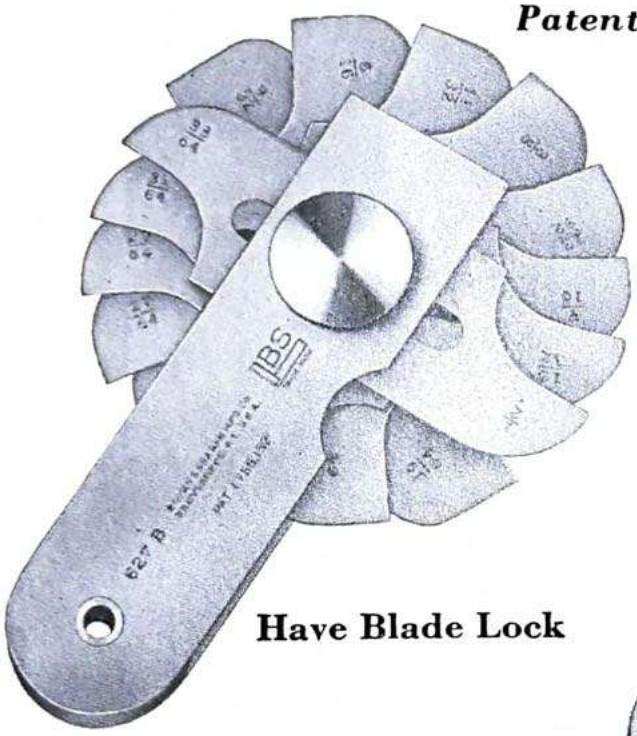
Patented

627 A

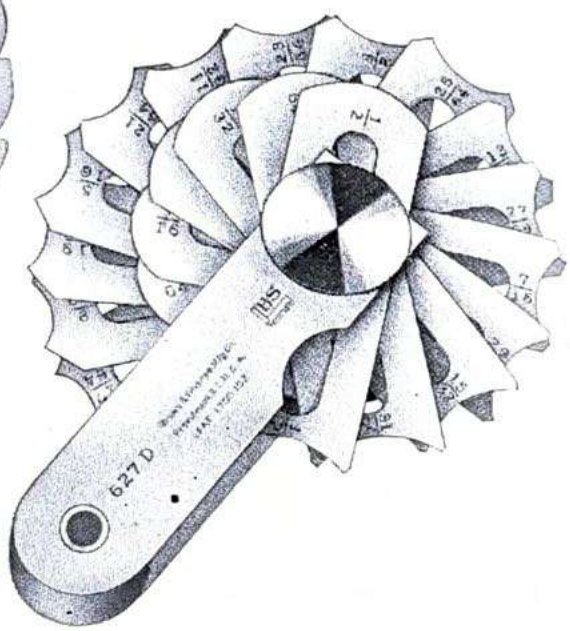
627 B

627 C

627 D



Have Blade Lock



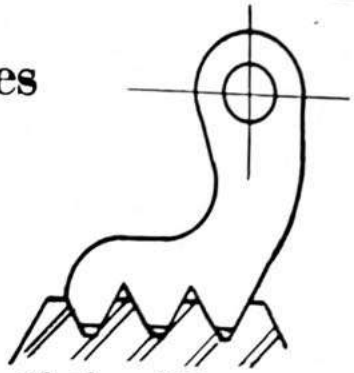
Long, sliding blades make these tools very easy to use and handle. Each gage has but half the usual number of blades for a given range. The desired size is found quickly. Practically all the blades can be extended at one time—a further convenience. Blades are hard rolled steel and can be clamped securely. They are about twice as long as usual blades and are double-ended; concave and convex radii of same size are on same blade.

Gages are made in two styles: Nos. 627A and 627B have blade form for checking fillets and radii in corners or against shoulders—see left-hand illustration. Nos. 627C and 627D are especially useful for laying out forming tools as well as for gaging fillets and radii—see right-hand illustration.

No.		No. of Blades	Radii, Size, Inches	Price
627	A	8	1-32 to 17-64, by 64ths	$1.50
	B	8	9-32 to 33-64, by 64ths	2.00
	C	15	1-32 to 1-4, by 64ths	1.75
	D	16	17-64 to 1-2, by 64ths	2.25

Each of the above packed one in a box; six boxes in a carton.

Screw Pitch Gages



National Form

Sharp V

630

The blades of Brown & Sharpe Screw Pitch Gages, except those for Metric and Whitworth Threads, are cut deeply, with the tops of teeth flatted so that one blade suffices for gaging "V" and American National or United States Standard Threads.

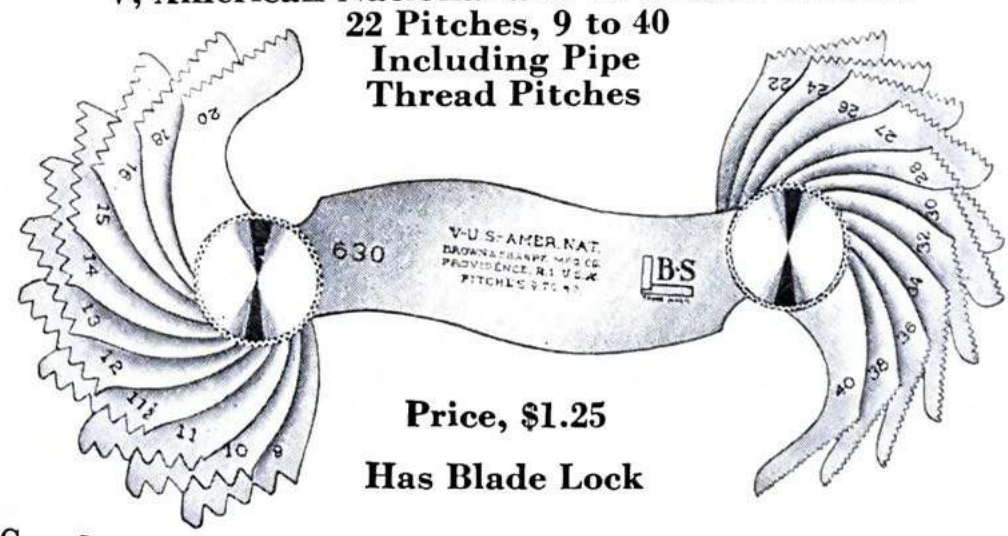
This is an original Brown & Sharpe feature —a desirable advantage as only one gage is needed for the three threads. The illustrations at right show the application of this form of gage to both American National and "V" Threads.

The shape of the blades adapts them for the threads of nuts as well as of screws. The arrangement of the blades, hinged in the case, enables the desired blade to be selected and used easily. The number of threads per inch is stamped on each blade.

Each gage has a Blade Lock by which any blade, or blades, can be locked in position for use.

Screw Pitch Gage No. 630

V, American National and U. S. Std. Threads
22 Pitches, 9 to 40
Including Pipe
Thread Pitches



Price, $1.25

Has Blade Lock

Gage No. 630 contains 22 blades for the following threads per inch: 9, 10, 11, 11½, 12, 13, 14, 15, 16, 18 and 20 on one end and 22, 24, 26, 27, 28, 30, 32, 34, 36, 38 and 40 on the other.

There are 22 pitches, including pipe thread, threads per inch, 11½ and 27. 8 pitch can be determined by using the 16 pitch blade.

Packed one in a box; six boxes in a carton.

Screw Pitch Gage No. 631

V, American National and U. S. Std. Threads. 24 Pitches, 4 to 30
Has Blade Lock
Price, $1.50

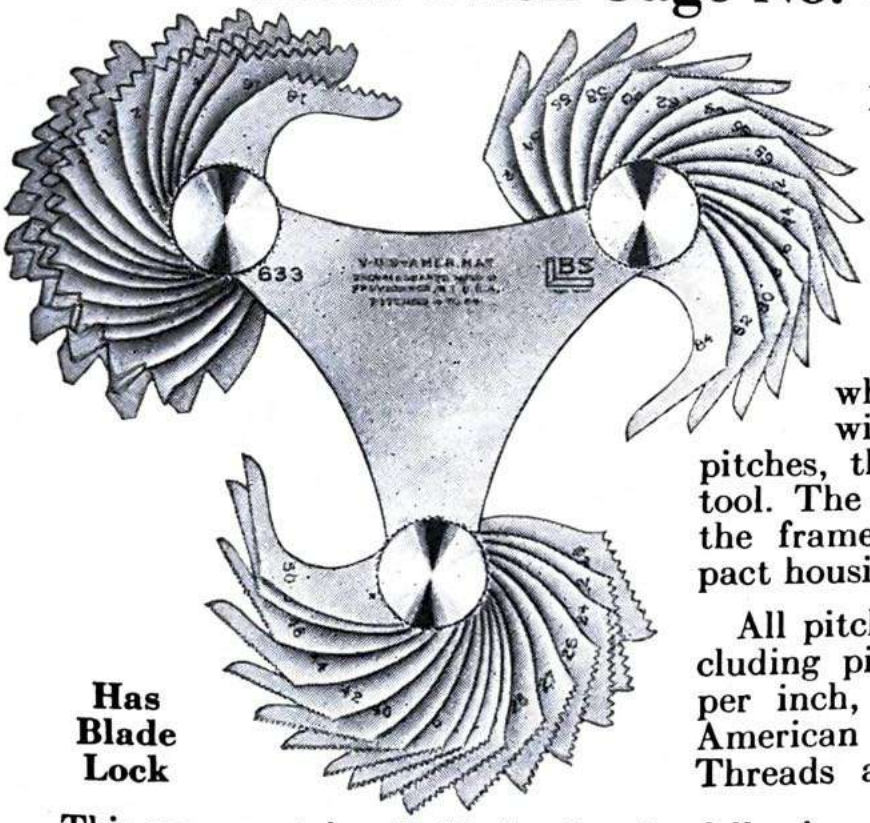
Similar in design to Screw Pitch Gage No. 630. It contains 24 blades with the following threads per inch: 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 11½ and 12 on one end and 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28 and
631 30 on the other.

Screw Pitch Gage No. 632

632 **V, American National and U. S. Std. Threads. 30 Pitches, 4 to 42**
633 **Has Blade Lock**
Price, $1.75

Similar in design to Screw Pitch Gage No. 630. It contains 30 blades with the following threads per inch: 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14 and 15 on one end and 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40 and 42 on the other.

Screw Pitch Gage No. 633



V, American National and U. S. Std. Threads

51 Pitches, 4 to 84
Price, $2.75

For the mechanic who has use for a gage with a great variety of pitches, this gage is just the tool. The triangular shape of the frame permits the compact housing of 51 blades.

All pitches of V threads including pipe threads, threads per inch, 11½ and 27, and American National and U. S. Threads are covered.

Has Blade Lock

This gage contains 51 blades for the following threads per inch: 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82 and 84.

Each of the above packed one in a box; six boxes in a carton.

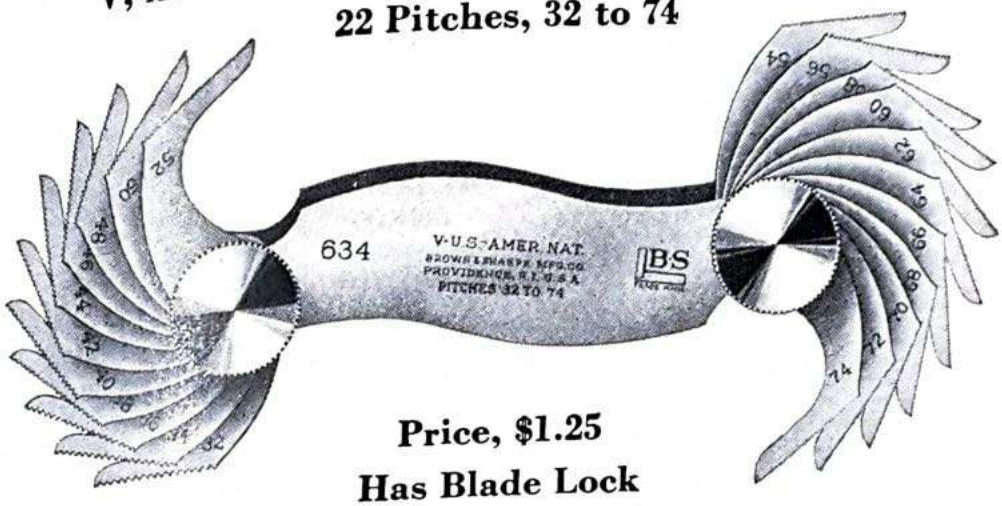
Screw Pitch Gage No. 634

V, American National and U. S. Std. Threads

22 Pitches, 32 to 74

634

635



Price, $1.25

Has Blade Lock

Screw Pitch Gage No. 634 is especially designed for those who require a gage for determining the number of threads per inch of screws with fine threads.

It contains 22 blades, with the following threads per inch: 32, 34, 36, 38, 40, 42, 44, 46, 48, 50 and 52 on one end, and 54, 56, 58, 60, 62, 64, 66, 68, 70, 72 and 74 on the other.

Screw Pitch Gage No. 635

V, American National and U. S. Std. Threads

25 Pitches, 2 1-4 to 20

Price, $2.00

Has Blade Lock

Has Gage for Grinding Thread Tools

This gage is similar to design to No. 634, shown above.

It contains 26 blades, with the following threads per inch: 2¼, 2⅜, 2½, 2⅝, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½ and 5 and thread gage on one end, and 5½, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18 and 20 on the other.

Each of the above packed one in a box; six boxes in a carton.

Formula for V thread:

$$d = D - \frac{1.733}{N}$$

D = Outside diameter of tap
d = Bottom diameter of tap
N = Number of threads per inch

Formula for American National and U. S. Standard thread:

$$d = D - \frac{1.299}{N}$$

D = Outside diameter of tap
d = Bottom diameter of tap
N = Number of threads per inch

Screw Pitch Gage No. 636

Système International

17 Pitches, 1-2 to 7 mm

Has Gage for Grinding Thread Tools

636

637

Price, $1.25

Has Blade Lock

For determining the pitch of screws, nuts, bolts, etc., and is made after the French system of the Société d'Encouragement pour l'Industrie Nationale. The gage contains 17 blades for the following pitches: ½, ¾, 1, 1¼, 1½, 1¾, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½ and 7 millimeters and blade for thread gage.

Screw Pitch Gage No. 637

Whitworth Standard **24 Pitches, 4 to 48**

Price, $1.50

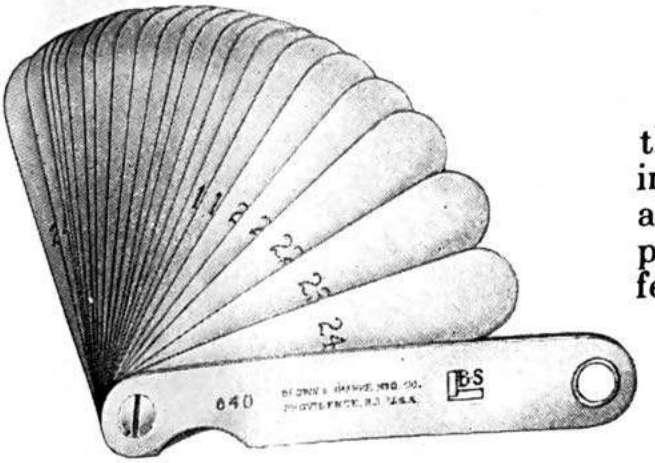
Has Blade Lock

Similar in design to gage shown above. Contains 24 blades, with the following threads per inch: 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 14 and 16 on one end; 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 40 and 48 on the other.

Each of the above packed one in a box; six boxes in a carton.

Thickness Gage No. 640

Blades, 2 5/16″ x 7/16″
Price, $2.50



Has 22 blades varying in thickness from .004″ to .025″, inclusive, by thousandths of an inch. The blades are tempered. Eyelet in case is handy feature.

640
641
642
643
644

Thickness Gage No. 641—Metric Measure

Price, $2.50

Blades, 2 5/16″ x 7/16″

Has 14 blades of the following thicknesses: .05, .06, .07, .08, .09, .10, .15, .20, .25, .30, .40, .50, .75 and 1 mm. The blades are tempered.

Thickness Gage No. 642

Price, $1.50

Blades, 2 5/16″ x 7/16″

Has 9 blades of the following thicknesses: .0015, .002, .003, .004, .006, .008, .010, .012 and .015 of an inch. The blades are tempered.

Thickness Gage No. 643—Metric Measure

Price, $1.50

Blades, 2 5/16″ x 7/16″

Has 9 blades of the following thicknesses: .04, .05, .08, .10, .15, .20, .25, .30 and .35 mm. The blades are tempered.

Thickness Gage No. 644

Price, $1.50

Blades, 3″ x 1/2″

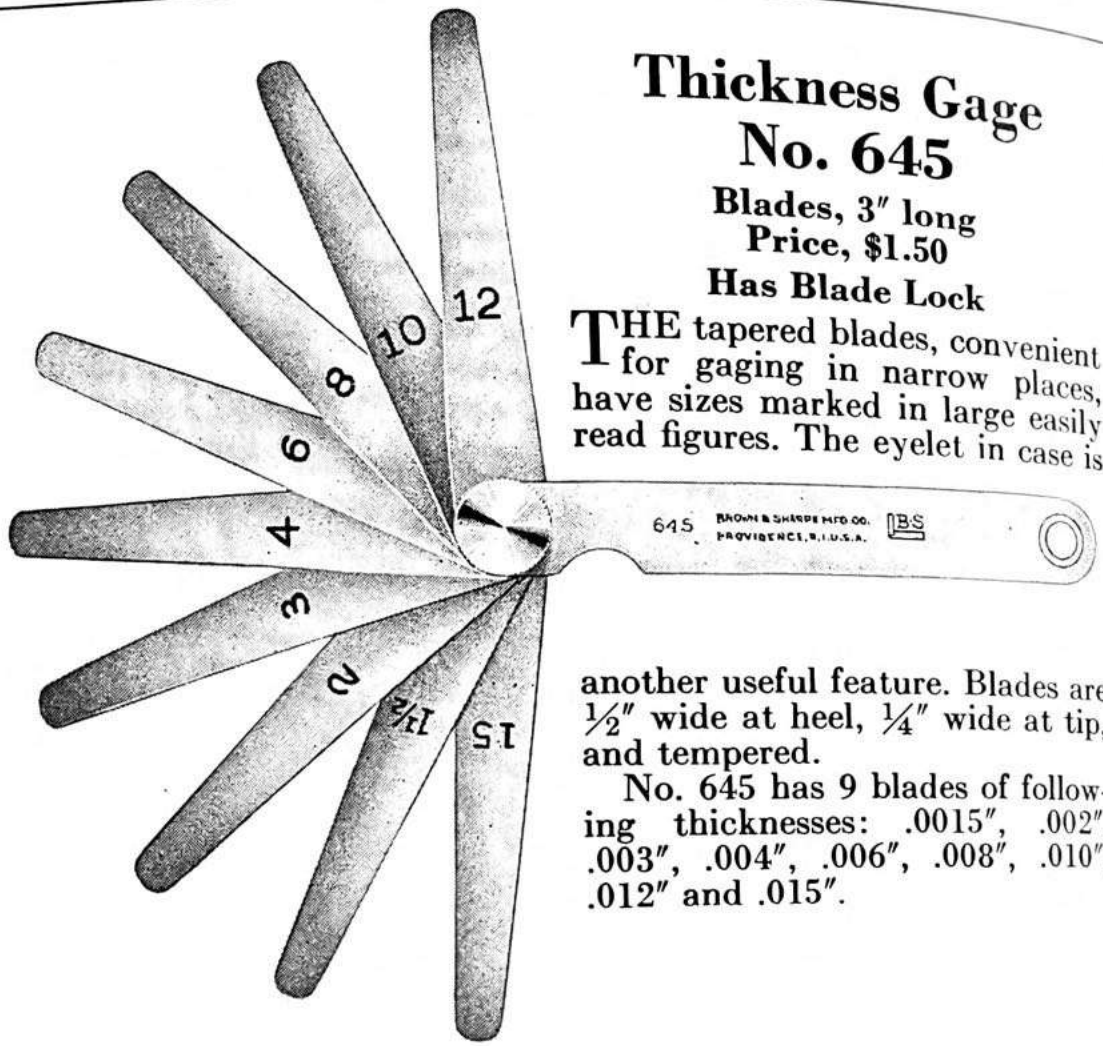
Has 9 blades of the following thicknesses: .0015, .002, .003, .004, .006, .008, .010, .012 and .015 of an inch. For those who require blades of a little greater length. The blades are tempered.

Each of the above packed one in a box; six boxes in a carton.

645

646

647



Thickness Gage No. 645

Blades, 3″ long
Price, $1.50
Has Blade Lock

THE tapered blades, convenient for gaging in narrow places, have sizes marked in large easily read figures. The eyelet in case is another useful feature. Blades are ½″ wide at heel, ¼″ wide at tip, and tempered.

No. 645 has 9 blades of following thicknesses: .0015″, .002″, .003″, .004″, .006″, .008″, .010″, .012″ and .015″.

Thickness Gage No. 646

Blades, 2 5/16″ x 7/16″ **Price, 90 cents**

Similar to No. 640, shown on preceding page, but has 6 blades of the following thicknesses: .0015, .002, .003, .004, .006 and .015 of an inch. The blades are tempered. Especially designed for the garage mechanic, car owner, and truck or tractor operator.

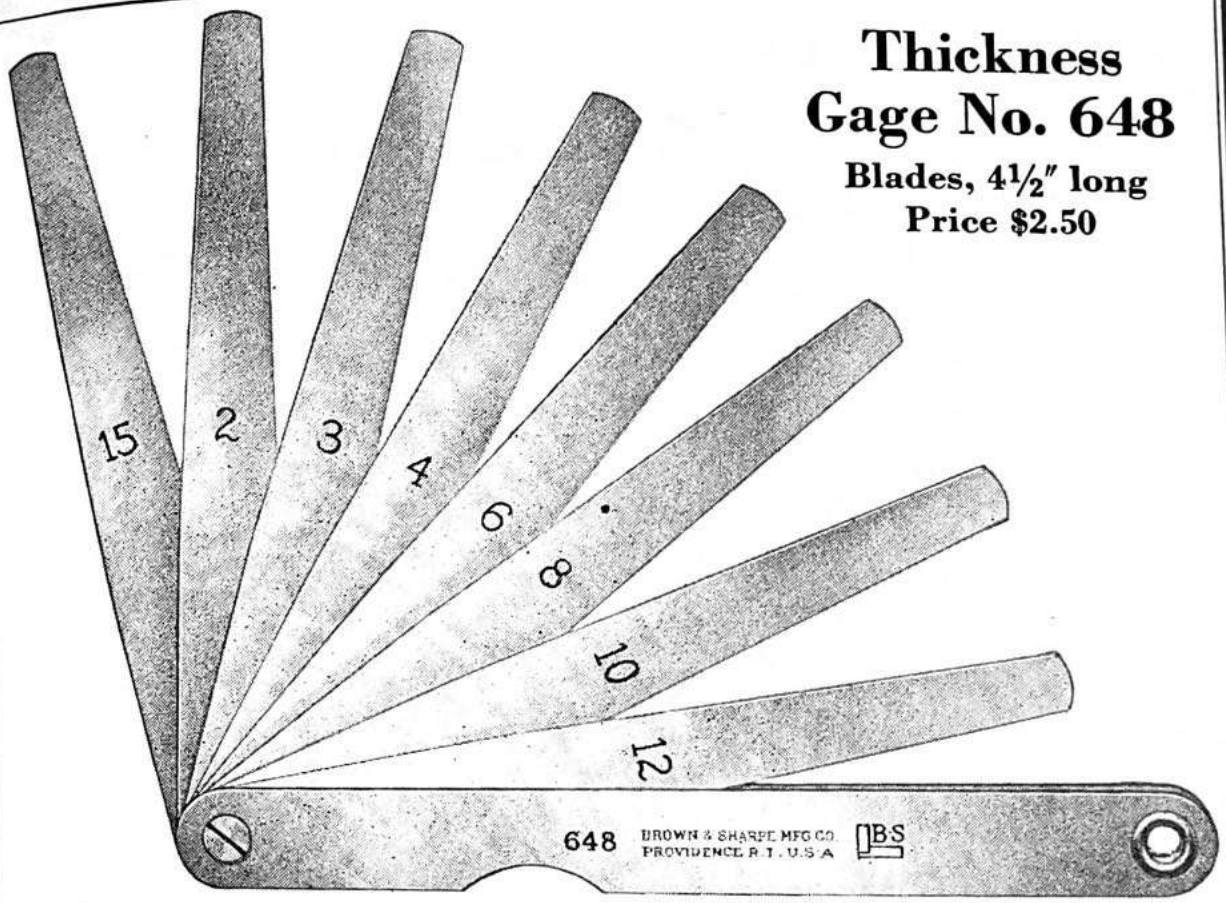
Thickness Gage No. 647

Blades, 3″ long

Has Blade Lock **Price, $3.50**

No. 647, similar to No. 645, has 26 blades as follows: .0015″ to .0025″ inclusive by half-thousandths, and .003″ to .025″ by thousandths.

Each of the above packed one in a box; six boxes in a carton.



Thickness Gage No. 648

Blades, 4½″ long
Price $2.50

648

648 M

649

649 M

Contains 8 blades of following thicknesses: .002″, .003″, .004″, .006″, .008″, .010″, .012″ and .015″.

Eyelet in case is handy feature. Blades are ½″ wide at heel and taper 2¾″ to tip, ¼″ wide. Blades are tempered.

Thickness Gage No. 648M

Blades, 4½″ long **Price, $2.50**

Similar to No. 648 shown above except blades are of following thicknesses: .05, .07, .10, .15, .20, .25, .30 and .40 mm. Blades are tempered.

Thickness Gage No. 649

Blades, 6″ long **Price, $3.00**

Similar to No. 648 except blades are 6″ long, ½″ wide at heel and taper for 2¾″ to ¼″ wide on end. Length is useful for finding clearance between pistons and cylinder walls.

Contains 8 blades of following thicknesses: .002″, .003″, .004″, .006″, .008″, .010″, .012″ and .015″. Blades are tempered.

Thickness Gage No. 649M

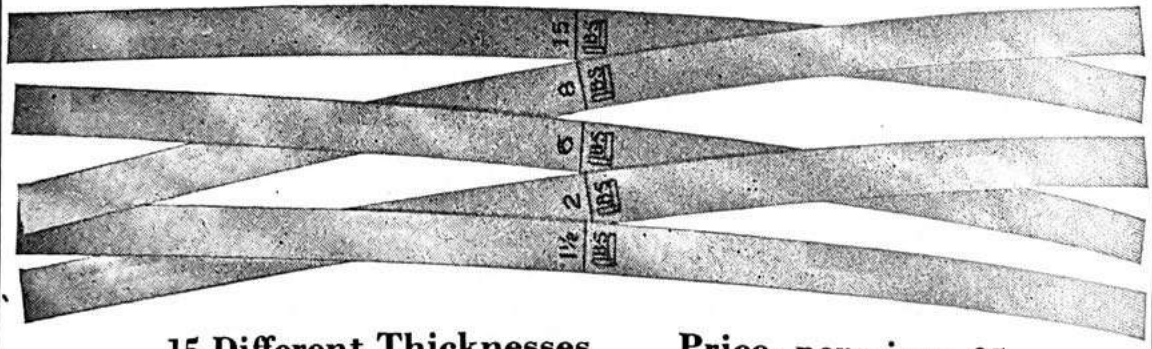
Blades, 6″ long **Price, $3.00**

Similar to No. 649 listed above except blades are of following thicknesses: .05, .07, .10, .15, .20, .25, .30 and .40 mm. Blades are tempered.

Each of the above packed one in a box; six boxes in a carton.

Thickness Gage Stock

in 12″ Lengths



15 Different Thicknesses **Price, per piece, 35 cents**

This is accurate high grade, uniformly tempered Thickness Gage Stock ½″ in width. The thickness of each piece is marked on it in large easily read figures together with the Brown & Sharpe Trade Mark, your assurance of reliable quality. To protect it from rust and staining, each piece is placed in an individual envelope having the thickness and length of piece printed on it. Furnished in the following sizes: .0015″, and .002″, to and including .015″ by thousandths.

Packed one piece in an envelope; twelve pieces of a size in a box.

Thickness Gage Stock

in 25 ft. rolls

10 Different Thicknesses

This is accurate, high grade uniformly tempered Thickness Gage Stock ½″ in width. The thickness of each piece is marked on it at 6″ intervals in large, easily read figures, together with the Brown & Sharpe Trade Mark, your assurance of reliable quality.

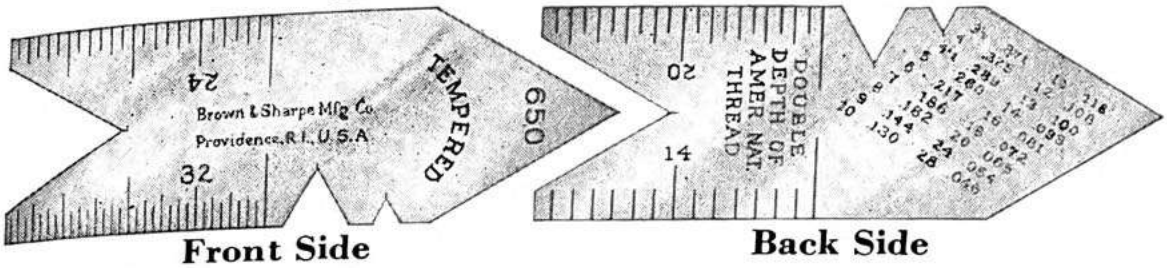
The case is a very desirable feature. Stock can be withdrawn length desired easily and without binding. Unused end is easily returned to case.

Thickness	Price per roll, includes Case
.0015″, .002″ and .003″	$8.50
.004″, .005″ and .006″	6.00
.007″, .008″, .010″ and .015″	5.00

Packed one case containing 25 ft. of stock in a box.

Center Gages Nos. 650, 651 and 652

With Table for Determining the Size of Tap Drills for American National Threads



Front Side **Back Side**

650 to 652

No. 650, American National or U. S. Std.

Price, 40 cents **Tempered, Price, 50 cents**

654

No. 651, Whitworth or English Standard, 55°

Price, 40 cents **Tempered, Price, 50 cents**

No. 652, Metric, 60°

Price, 40 cents **Tempered, Price, 50 cents**

The angles used on these gages are 60° for the American National or U. S. Std. and Metric Gages, and 55° for the Whitworth or English Standard. The four graduations, 14, 20, 24 and 32 parts to the inch, are useful in measuring the number of threads to the inch.

The Metric Gage is graduated to read in millimeters and half-millimeters.

The table on the gage is used for determining the size of tap drills for American National or U. S. Std. threads, and shows in thousandths of an inch the double depth of thread of tap and screw of the pitches most commonly used.

The table for determining the size of tap drills is omitted on the Metric Gage.

Each of the above packed twelve in a box.

Center Gage Attachment No. 654

Price, 50 cents

The attachment holds the center gage firmly against the lathe spindle or face plate, aiding in setting the cutting tool to the proper angle.

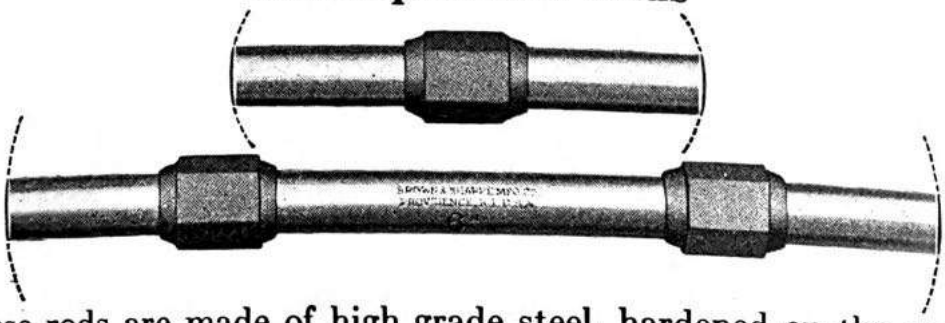
The base of the attachment has a V groove and in the top there is a slot, containing a flat spring which holds the center gage. It can be used for setting both internal and external screw cutting tools.

Packed three in a box.

Standard End Measuring Rods
Nos. 655 and 656
With Spherical Ends

655

656



These rods are made of high grade steel, hardened on the ends and accurately ground so that the ends are sections of true spheres having diameters slightly less than the length of the rods. They are especially useful for measuring parallel surfaces, rings, cylinders, etc., setting calipers, comparing gages and testing precision measuring tools.

The rubber grips are a useful feature as they resist the heat and moisture of the hand and prevent the rods from slipping or rolling. The 3″ and 4″ rods are furnished with one rubber grip, and the 5″ and over have two grips.

No. 655, English

Length, Inches	Diam., Inches	Price	Length, Inches	Diam., Inches	Price	Length, Inches	Diam., Inches	Price
3	3-8	**$2.10**	10	3-8	**$4.20**	17	3-8	$6.60
4	3-8	**2.40**	11	3-8	**4.50**	18	3-8	7.20
5	3-8	**2.70**	12	3-8	**4.80**	19	3-8	7.80
6	3-8	**3.00**	13	3-8	**5.10**	20	3-8	8.40
7	3-8	**3.30**	14	3-8	**5.40**	21	3-8	9.00
8	3-8	**3.60**	15	3-8	**5.70**	22	3-8	9.60
9	3-8	**3.90**	16	3-8	**6.00**	23	3-8	10.20

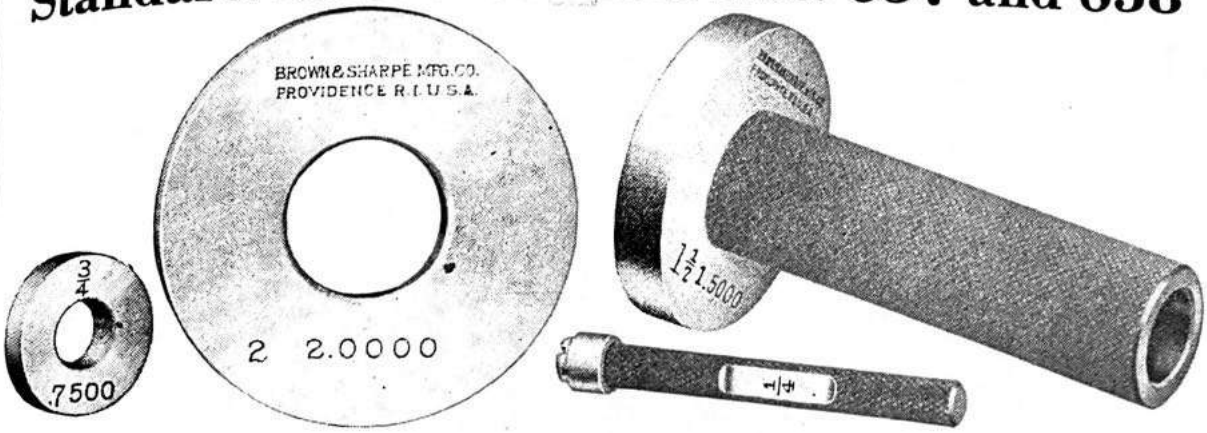
No. 656, Metric

Length, mm	Diam., mm	Price	Length, mm	Diam., mm	Price	Length, mm	Diam., mm	Price
75	10	**$2.10**	250	10	**$4.20**	425	10	$6.60
100	10	**2.40**	275	10	**4.50**	450	10	7.20
125	10	**2.70**	300	10	**4.80**	475	10	7.80
150	10	**3.00**	325	10	**5.10**	500	10	8.40
175	10	**3.30**	350	10	**5.40**	525	10	9.00
200	10	**3.60**	375	10	**5.70**	550	10	9.60
225	10	**3.90**	400	10	**6.00**	575	10	10.20

We are prepared to furnish intermediate sizes, both English and Metric. Prices on application.

Each of the above packed one in a tubular container.

Standard Reference Disks Nos. 657 and 658



657

658

Made of high grade tool steel, hardened, ground and accurately lapped to size. Handles make them convenient for internal testing. Recommended for use as reference gages and not for working gages. Sizes as shown below. Special sizes to order.

No. 657, English

Size, Inches	Price	Size, Inches	Price	Size, Inches	Price	Size, Inches	Price	Size, Inches	Price
*1-4	$1.50	13-16	$1.20	1 3-8	$1.50	1 15-16	$2.00	2 1-2	$2.50
*5-16	1.50	7-8	1.20	1 7-16	1.50	2	2.00	2 9-16	2.50
3-8	1.00	15-16	1.20	1 1-2	1.50	2 1-16	2.25	2 5-8	2.50
7-16	1.00	1	1.30	1 9-16	1.70	2 1-8	2.25	2 11-16	2.50
1-2	1.10	1 1-16	1.30	1 5-8	1.70	2 3-16	2.25	2 3-4	2.75
9-16	1.10	1 1-8	1.30	1 11-16	1.70	2 1-4	2.25	2 13-16	2.75
5-8	1.10	1 3-16	1.30	1 3-4	1.70	2 5-16	2.50	2 7-8	2.75
11-16	1.10	1 1-4	1.30	1 13-16	2.00	2 3-8	2.50	2 15-16	2.75
3-4	1.20	1 5-16	1.50	1 7-8	2.00	2 7-16	2.50	3	2.75

No. 658, Metric

Size, mm	Price	Size, mm	Price	Size, mm	Price	Size, mm	Price	Size, mm	Price	Size, mm	Price
*6	$1.50	18	$1.10	28	$1.30	40	$1.70	55	$2.25	85	$3.00
*8	1.50	20	1.20	30	1.30	42	1.70	60	2.50	90	3.00
10	1.00	22	1.20	32	1.30	44	1.70	65	2.50	95	3.25
12	1.10	24	1.20	34	1.50	46	2.00	70	2.75	100	3.25
14	1.10	25	1.30	36	1.50	48	2.00	75	2.75		
16	1.10	26	1.30	38	1.50	50	2.00	80	3.00		

*These sizes are furnished with handles.

Price of Handles

For 3/8″ to 9/16″ or 10 mm to 14 mm Disks $0.65
For 5/8″ to 1 1/16″ or 16 mm to 26 mm Disks 75
For 1 1/8″ to 1 3/4″ or 28 mm to 44 mm Disks 80
For 1 13/16″ to 3″ or 46 mm to 75 mm Disks 90
For 80 mm to 100 mm Disks 90

Each of the above packed one in a package.

Standard Reference Disk Set. English Gages in sets in sizes from 1/4″ to 3″, by 16ths, furnished in substantial wooden case. Price, per set, **$90.00.** Packed one set in a box.

Cylindrical Plug Gages No. 659 and Ring Gages No. 664

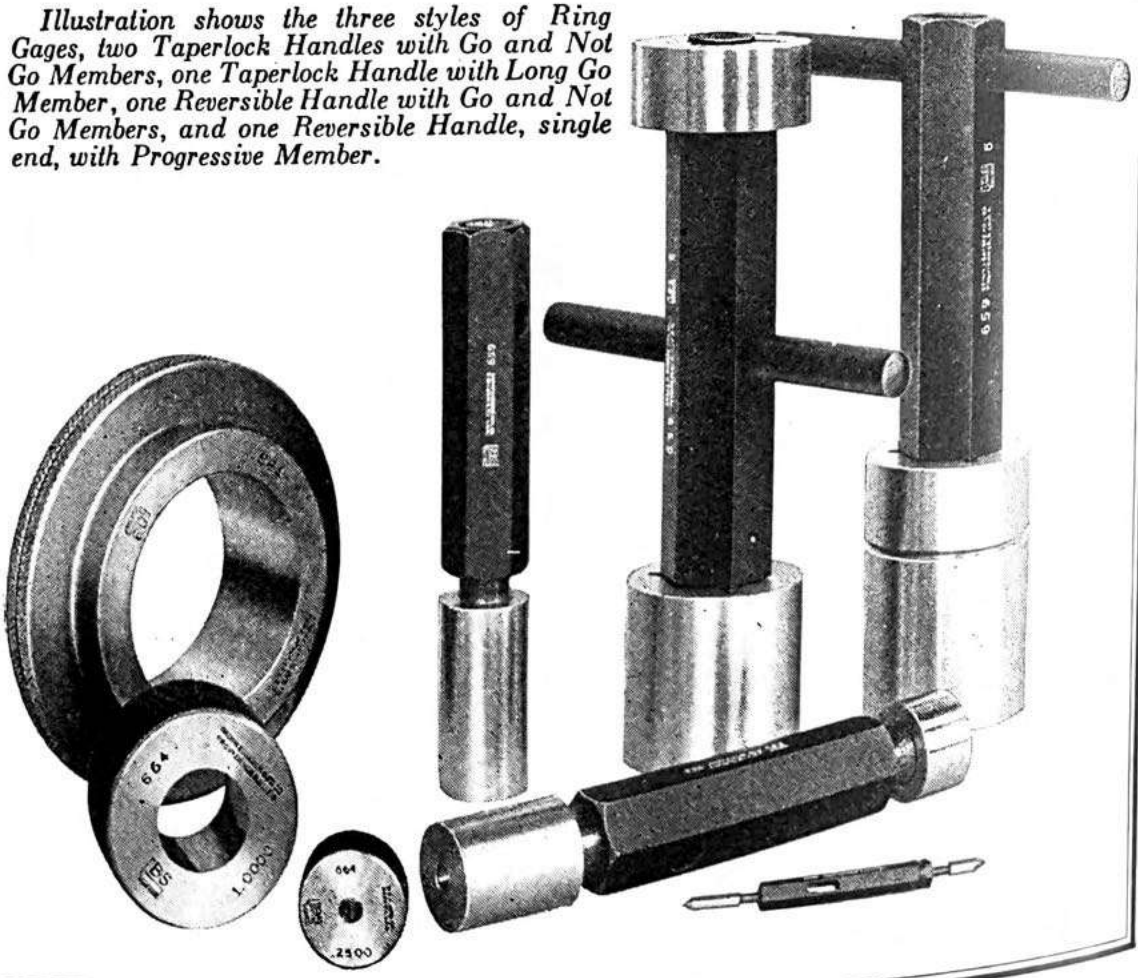
(*American Gage Design Standard*)

THESE gages conform in design to the standards specified by the American Gage Design Committee. The Cylindrical Plug Gages are made with separate handles and gage members. This is a desirable and practical feature as it permits replacing a worn or damaged gage member without replacing the handles. The gage members are made of highest grade tool steel, heat treated, hardened, ground and lapped. They are gages of a most convenient and practical design made to Brown & Sharpe standards of quality.

Cylindrical Plug Gages No. 659, of Taperlock design, are made in sizes above .059″ to and including 1.510″. Cylindrical Plug Gages No. 659, of Reversible design, are made in sizes above 1.510″ to and including 4.510″. Go and Not Go Members are furnished for all these sizes. Long Go and Progressive Members are furnished in sizes from .241″ to 2.510″.

Ring Gages are made in three styles, each of which includes Go and Not Go Gages. Sizes above .059″ and including .510″ are two-piece

Illustration shows the three styles of Ring Gages, two Taperlock Handles with Go and Not Go Members, one Taperlock Handle with Long Go Member, one Reversible Handle with Go and Not Go Members, and one Reversible Handle, single end, with Progressive Member.



construction with a hardened, ground and lapped steel bushing in a soft steel body. Sizes above .510″ are made solid. Those above 1.510″ have flanges to eliminate unnecessary weight. Not Go Ring Gages can be told at a glance by the annular groove.

Cylindrical Plug Gages No. 659 and Ring Gages No. 664 are finished, also, in corresponding millimeter sizes.

All gage parts can be duplicated promptly from our large stock of blanks and handles. Prices of gages in individual lots and in quantities upon application.

In ordering gages specify in decimals exact size required.

Cylindrical Plug Gages

Cylindrical Plug Gages can be furnished in the finishes and tolerances shown below. The tolerances are plus on Go and Standard Gages and minus on Not Go Gages.

Class X—Precision Lapped. This is the highest degree of lapped finish, suitable for master or reference gages.

Range		Tolerance, Inches	Range		Tolerance, Inches
Above, Inches	To and Including, Inches		Above, Inches	To and Including, Inches	
.059	.825	.00004	1.510	2.510	.00008
.825	1.510	.00006	2.510	4.510	.00010

Class Y—Lapped. This finish is suitable for most gaging requirements.

Range		Tolerance, Inches	Range		Tolerance, Inches
Above, Inches	To and Including, Inches		Above, Inches	To and Including, Inches	
.059	.825	.00008	1.510	2.510	.00014
.825	1.510	.00010	2.510	4.510	.00018

Class Z—Commercial Finish. Gages with this finish are ground and polished but not lapped. They are less expensive gages for use where manufacturing limits do not require the closer tolerances of the Class X or Class Y finishes.

Range		Tolerance, Inches	Range		Tolerance, Inches
Above, Inches	To and Including, Inches		Above, Inches	To and Including, Inches	
.059	.825	.00010	1.510	2.510	.00018
.825	1.510	.00012	2.510	4.510	.00025

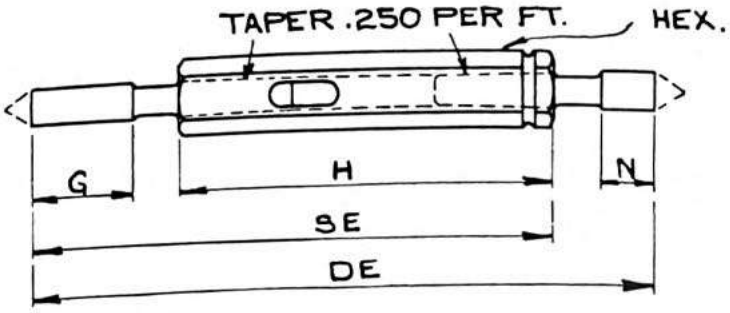
Unless otherwise ordered, Brown & Sharpe Cylindrical Plug Gages are made to Class Y tolerances.

659

Cylindrical Plug Gages No. 659

(American Gage Design Standard)

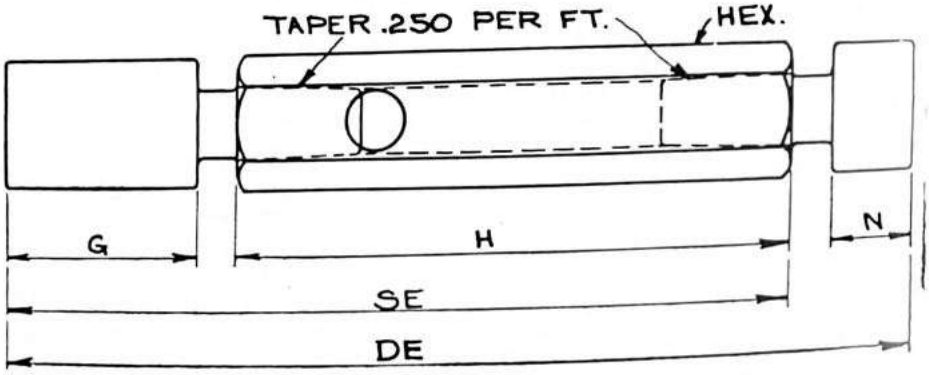
TAPERLOCK



All dimensions given in inches.

Series	Range		Approximate		H	Hex.	Approximate	
	Above	To and including	G	N			SE	DE
000	.059	.105	3-8	3-16	1 1-2	3-16	2 3-64	2 13-32
00	.105	.150	7-16	7-32	1 3-4	1-4	2 25-64	2 13-16
0	.150	.240	19-32	9-32	2	5-16	2 27-32	3 3-8

Groove in handle indicates "Not Go" end.



All dimensions given in inches.

Series	Range		Approximate		H	Hex.	Approximate	
	Above	To and including	G	N			SE	DE
1	.240	.365	3-4	5-16	2 3-4	3-8	3 3-4	4 5-16
2	.365	.510	1	3-8	3	1-2	4 1-4	4 7-8
3	.510	.825	1 1-4	1-2	3 1-4	11-16	4 3-4	5 1-2
4	.825	1.135	1 3-8	5-8	3 5-8	7-8	5 5-16	6 1-4
5	1.135	1.510	1 1-2	3-4	4	1 1-8	5 7-8	7

Prices upon application. Each of the above packed one in a package.

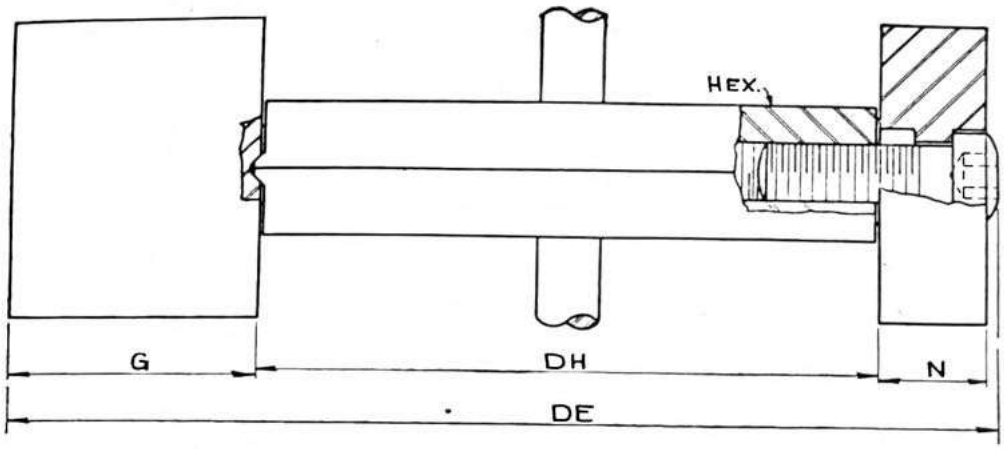
Cylindrical Plug Gages No. 659

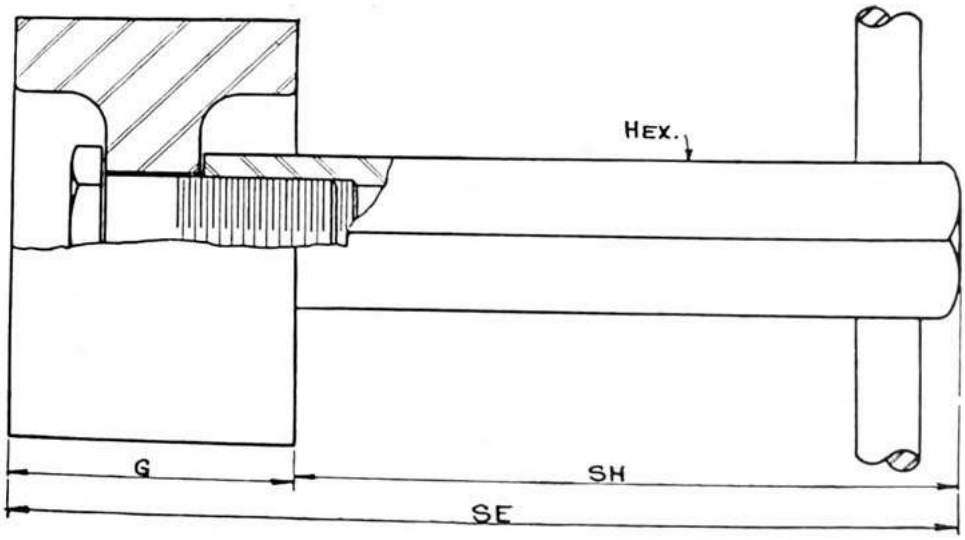
659

(American Gage Design Standard)

REVERSIBLE

The Reversible Design permits gaging member to be reversed when worn.





All dimensions given in inches.

Series	Range		G	N	DH	DE	SH	SE	Hex.
	Above	To and including							
6	1.510	2.010	1 7-8	7-8	4 7-8	7 23-32	4 15-16	6 13-16	1 1-8
6	2.010	2.510	2	7-8	4 7-8	7 27-32	4 15-16	6 15-16	1 1-8
7	2.510	3.010	2 1-8	1	5 1-16	8 11-32	5 1-4	7 3-8	1 1-4
7	3.010	4.510	2 1-4	1	5	8 13-32	5 3-16	7 7-16	1 1-4

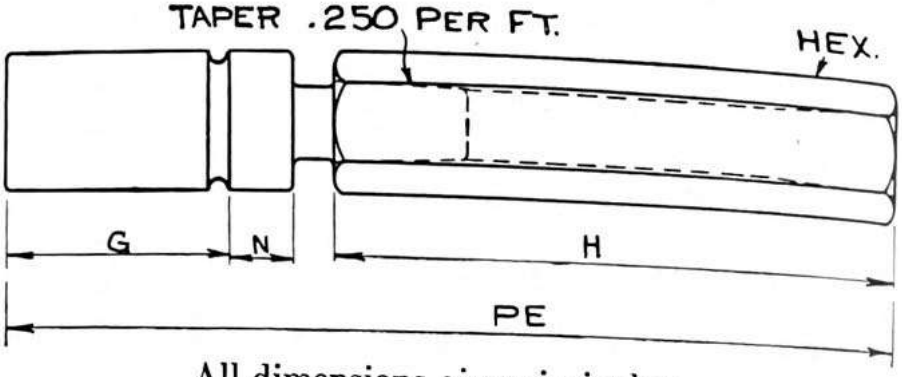
Prices upon application. Each of the above packed one in a package.

Cylindrical Plug Gages No. 659

(American Gage Design Standard)

PROGRESSIVE—TAPERLOCK

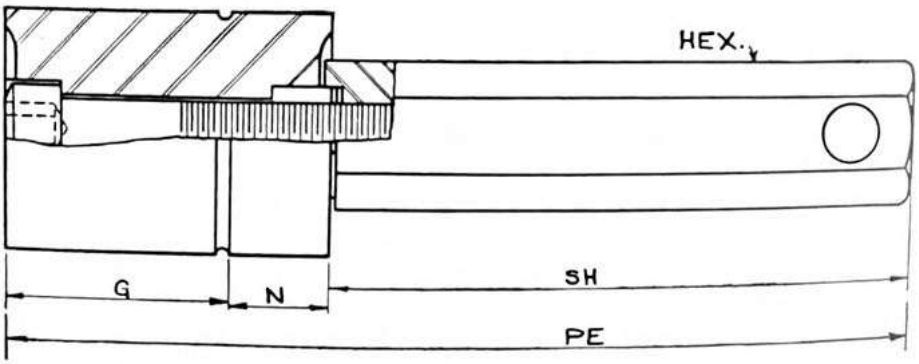
659



All dimensions given in inches.

Series	Range		G	N	H	Approx.	Hex.
	Above	To and including				PE	
1	.240	.365	7-8	5-16	2 3-4	4 3-16	3-8
2	.365	.510	1 1-8	3-8	3	4 3-4	1-2
3	.510	.825	1 3-8	1-2	3 1-4	5 3-8	11-16
4	.825	1.135	1 1-2	5-8	3 5-8	6 1-16	7-8
5	1.135	1.510	1 5-8	3-4	4	6 3-4	1 1-8

PROGRESSIVE—REVERSIBLE



All dimensions given in inches.

Series	Range		G	N	SH	PE	Hex.
	Above	To and including					
6	1.510	2.010	2	7-8	4 15-16	7 13-16	1 1-8
6	2.010	2.510	2 1-8	7-8	4 15-16	7 15-16	1 1-8

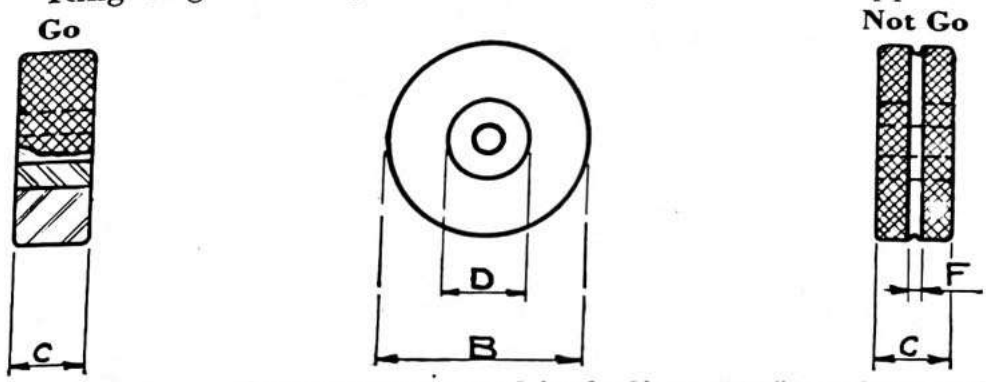
Long members have same overall lengths for respective diameters as progressive members, but do not have groove.

Prices upon application. Each of the above packed one in a package.

Ring Gages No. 664

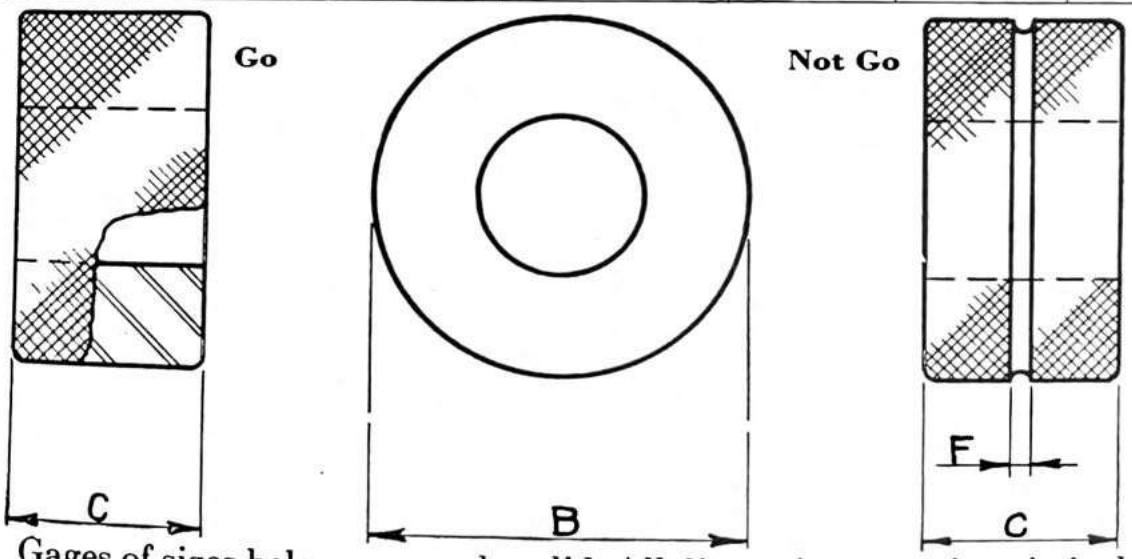
(American Gage Design Standard)

Ring Gages are regularly furnished ground and lapped.



Gaging members of gages up to and including .510″ are inserted bushings. All dimensions are given in inches.

Series	Range		B	C	D	F
	Above	To and including				
00	.059	.150	15-16	3-16	3-8	1-32
0	.150	.240	15-16	3-8	7-16	1-16
1	.240	.365	1 1-8	9-16	9-16	3-32
2	.365	.510	1 3-8	3-4	3-4	3-32



Gages of sizes below are made solid. All dimensions are given in inches.

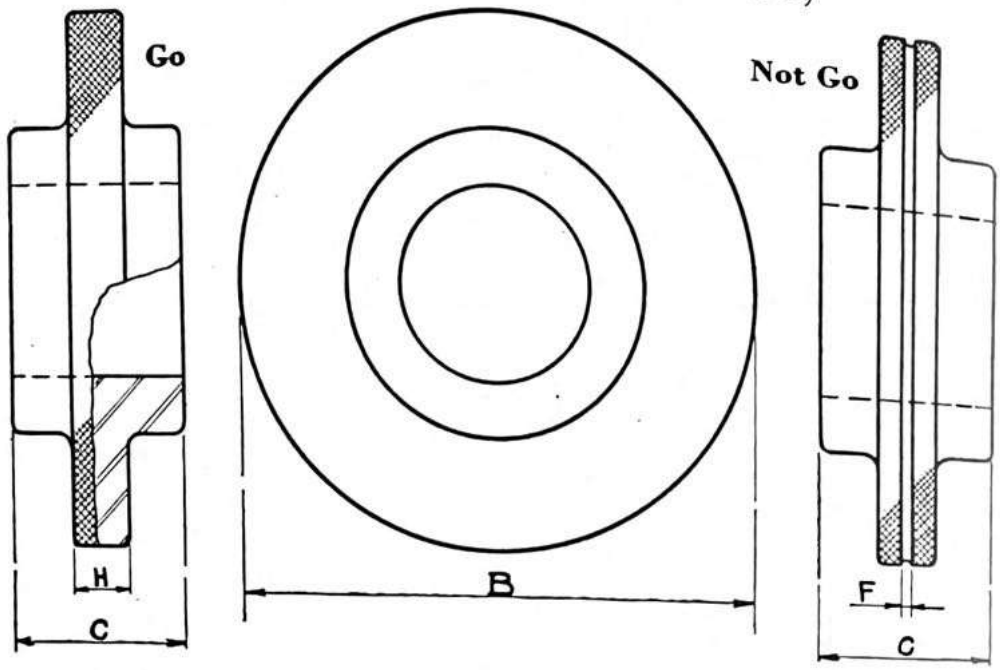
Series	Range		B	C	F
	Above	To and including			
3	.510	.825	1 3-4	15-16	3-32
4	.825	1.135	2 1-8	1 1-8	3-32
5	1.135	1.510	2 1-2	1 5-16	3-32

Prices upon application. Each of the above packed one in a package.

664

Ring Gages No. 664

(*American Gage Design Standard*)



Gages of sizes below are made solid. All dimensions are given in inches.

Series	Range		B	C	F	H
	Above	To and including				
6	1.510	2.010	4 1-8	1 1-2	3-32	1-2
7	2.010	2.510	4 5-8	1 1-2	3-32	1-2
8	2.510	3.010	5 1-2	1 1-2	3-32	1-2
9	3.010	3.510	6	1 1-2	3-32	1-2
10	3.510	4.010	6 7-8	1 1-2	3-32	1-2
11	4.010	4.510	7 3-8	1 1-2	3-32	1-2

Prices upon application.
Each of the above packed one in a package.

Standard Caliper Gages
Nos. 665, 666, 667, 668, 669 and 670

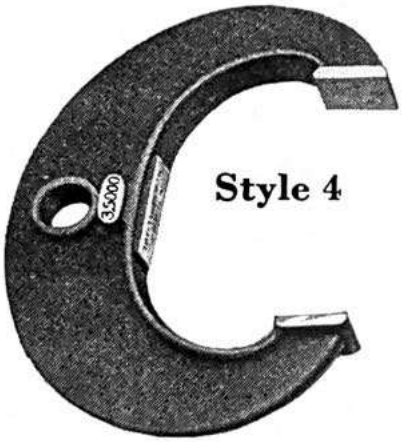
The Standard Caliper Gages are carefully hardened and ground and accurately lapped to size. Their form gives lightness and strength, making them preferable to plugs and rings for frequent use. The measuring surfaces are amply large to insure accurate measurements and the maintenance of gage sizes. As convenient and reliable standard sizes for everyday use in the workshop, they are of great advantage, and their use will contribute to uniformity in the production of the working parts of machinery.

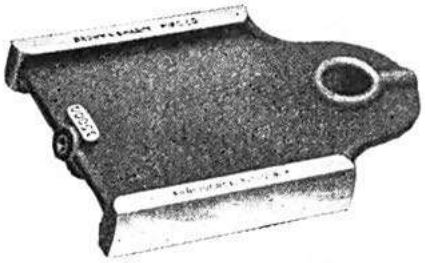
They are furnished with both ends finished, one end for internal and the other for external measurements, in sizes to three inches, or with one end only finished, either for internal or for external measurements, and provided with handles.

Style 1 is furnished in sets, comprising sizes from ¼″ to 2½″ inclusive, varying by 16ths to 2″ and above 2″ by 8ths. Each set is furnished in a Substantial Wooden Case. **Price, per Set, $140.00.**

For convenience in handling, the Standard Caliper Gages in the larger sizes are made as shown at right.

For List of Caliper Gages, see following pages.





Style 5

Standard Caliper Gages No. 665

BOTH ENDS FINISHED

English — Style 1

665

666

Size, Inches	Price, Each	Size, Inches	Price, Each	Size, Inches	Price, Each
1-4	$3.50	1 3-16	$4.00	2 1-8	$5.60
5-16	3.50	1 1-4	4.05	2 3-16	5.75
3-8	3.50	1 5-16	4.15	2 1-4	5.90
7-16	3.50	1 3-8	4.20	2 5-16	6.00
1-2	3.50	1 7-16	4.25	2 3-8	6.15
9-16	3.50	1 1-2	4.35	2 7-16	6.30
5-8	3.50	1 9-16	4.50	2 1-2	6.45
11-16	3.50	1 5-8	4.60	2 9-16	7.00
3-4	3.50	1 11-16	4.75	2 5-8	7.35
13-16	3.55	1 3-4	4.90	2 11-16	7.70
7-8	3.65	1 13-16	5.05	2 3-4	7.70
15-16	3.70	1 7-8	5.20	2 13-16	8.40
1	3.80	1 15-16	5.30	2 7-8	8.40
1 1-16	3.85	2	5.45	2 15-16	8.40
1 1-8	3.90	2 1-16	5.55	3	9.10

Standard Caliper Gages No. 666

Metric — Style 1

Size, mm	Price, Each	Size, mm	Price, Each	Size, mm	Price, Each	Size, mm	Price, Each
5	$3.50	24	$3.70	43	$4.75	62	$6.30
6	3.50	25	3.80	44	4.90	63	6.45
7	3.50	26	3.85	45	4.90	64	6.45
8	3.50	27	3.85	46	5.05	65	7.00
9	3.50	28	3.90	47	5.20	66	7.35
10	3.50	29	4.00	48	5.20	67	7.35
11	3.50	30	4.00	49	5.30	68	7.70
12	3.50	31	4.05	50	5.45	69	7.70
13	3.50	32	4.05	51	5.45	70	7.70
14	3.50	33	4.15	52	5.55	71	8.40
15	3.50	34	4.20	53	5.55	72	8.40
16	3.50	35	4.20	54	5.60	73	8.40
17	3.50	36	4.25	55	5.75	74	8.40
18	3.50	37	4.25	56	5.75	75	8.40
19	3.50	38	4.35	57	5.90	76	9.20
20	3.55	39	4.50	58	6.00		
21	3.55	40	4.50	59	6.00		
22	3.65	41	4.60	60	6.15		
23	3.70	42	4.75	61	6.30		

Each of the above packed one in a package.

Standard Caliper Gages No. 667

Internal — English

Style 3 up to and including $2\frac{15}{16}''$; the rest are Style 5.

667

Size, Inches	Price, Each	Size, Inches	Price, Each	Size, Inches	Price, Each
1-4	$1.95	1 7-8	$2.95	3 1-2	$4.90
5-16	1.95	1 15-16	2.95	3 9-16	5.25
3-8	1.95	2	3.10	3 5-8	5.25
7-16	1.95	2 1-16	3.10	3 11-16	5.25
1-2	1.95	2 1-8	3.10	3 3-4	5.25
9-16	1.95	2 3-16	3.20	3 13-16	5.60
5-8	1.95	2 1-4	3.20	3 7-8	5.60
11-16	1.95	2 5-16	3.20	3 15-16	5.60
3-4	2.05	2 3-8	3.35	4	5.60
13-16	2.05	2 7-16	3.35	4 1-8	5.95
7-8	2.05	2 1-2	3.50	4 1-4	5.95
15-16	2.05	2 9-16	3.90	4 3-8	5.95
1	2.10	2 5-8	4.05	4 1-2	5.95
1 1-16	2.10	2 11-16	4.20	4 5-8	5.95
1 1-8	2.15	2 3-4	4.20	4 3-4	5.95
1 3-16	2.15	2 13-16	4.60	4 7-8	5.95
1 1-4	2.25	2 7-8	4.60	5	5.95
1 5-16	2.25	2 15-16	4.60	5 1-8	6.30
1 3-8	2.30	3	4.60	5 1-4	6.30
1 7-16	2.30	3 1-16	4.60	5 3-8	6.30
1 1-2	2.40	3 1-8	4.60	5 1-2	6.30
1 9-16	2.45	3 3-16	4.60	5 5-8	6.30
1 5-8	2.50	3 1-4	4.60	5 3-4	6.30
1 11-16	2.65	3 5-16	4.90	5 7-8	6.30
1 3-4	2.80	3 3-8	4.90	6	6.30
1 13-16	2.80	3 7-16	4.90		

Larger sizes made to order. Prices upon application.

Standard Caliper Gages No. 668

Internal — Metric — Style 5

668

Size, mm	Price, Each	Size, mm	Price, Each	Size, mm	Price, Each	Size, mm	Price, Each
79	$4.60	87	$4.90	95	$5.25	115	$5.95
80	4.60	88	4.90	96	5.60	120	5.95
81	4.60	89	5.25	97	5.60	125	5.95
82	4.60	90	5.25	98	5.60	130	6.30
83	4.90	91	5.25	99	5.60	135	6.30
84	4.90	92	5.25	100	5.60	140	6.30
85	4.90	93	5.25	105	5.95	145	6.30
86	4.90	94	5.25	110	5.95	150	6.30

Intermediate sizes, not listed between 100 mm and 150 mm, are made to order. Prices upon application.

Each of the above packed one in a package.

Standard Caliper Gages No. 669

External — English

Style 2 up to and including 2″; the rest are Style 4.

669

670

Size, Inches	Price, Each	Size, Inches	Price, Each	Size, Inches	Price, Each
1-4	$1.95	1 7-8	$2.95	3 1-2	$4.90
5-16	1.95	1 15-16	2.95	3 9-16	5.25
3-8	1.95	2	3.10	3 5-8	5.25
7-16	1.95	2 1-16	3.10	3 11-16	5.25
1-2	1.95	2 1-8	3.10	3 3-4	5.25
9-16	1.95	2 3-16	3.20	3 13-16	5.60
5-8	1.95	2 1-4	3.20	3 7-8	5.60
11-16	1.95	2 5-16	3.20	3 15-16	5.60
3-4	2.05	2 3-8	3.35	4	5.60
13-16	2.05	2 7-16	3.35	4 1-8	5.95
7-8	2.05	2 1-2	3.50	4 1-4	5.95
15-16	2.05	2 9-16	3.90	4 3-8	5.95
1	2.10	2 5-8	4.05	4 1-2	5.95
1 1-16	2.10	2 11-16	4.20	4 5-8	5.95
1 1-8	2.15	2 3-4	4.20	4 3-4	5.95
1 3-16	2.15	2 13-16	4.60	4 7-8	5.95
1 1-4	2.25	2 7-8	4.60	5	5.95
1 5-16	2.25	2 15-16	4.60	5 1-8	6.30
1 3-8	2.30	3	4.60	5 1-4	6.30
1 7-16	2.30	3 1-16	4.60	5 3-8	6.30
1 1-2	2.40	3 1-8	4.60	5 1-2	6.30
1 9-16	2.45	3 3-16	4.60	5 5-8	6.30
1 5-8	2.50	3 1-4	4.60	5 3-4	6.30
1 11-16	2.65	3 5-16	4.90	5 7-8	6.30
1 3-4	2.80	3 3-8	4.90	6	6.30
1 13-16	2.80	3 7-16	4.90		

Larger sizes made to order. Prices upon application.

Standard Caliper Gages No. 670

External — Metric

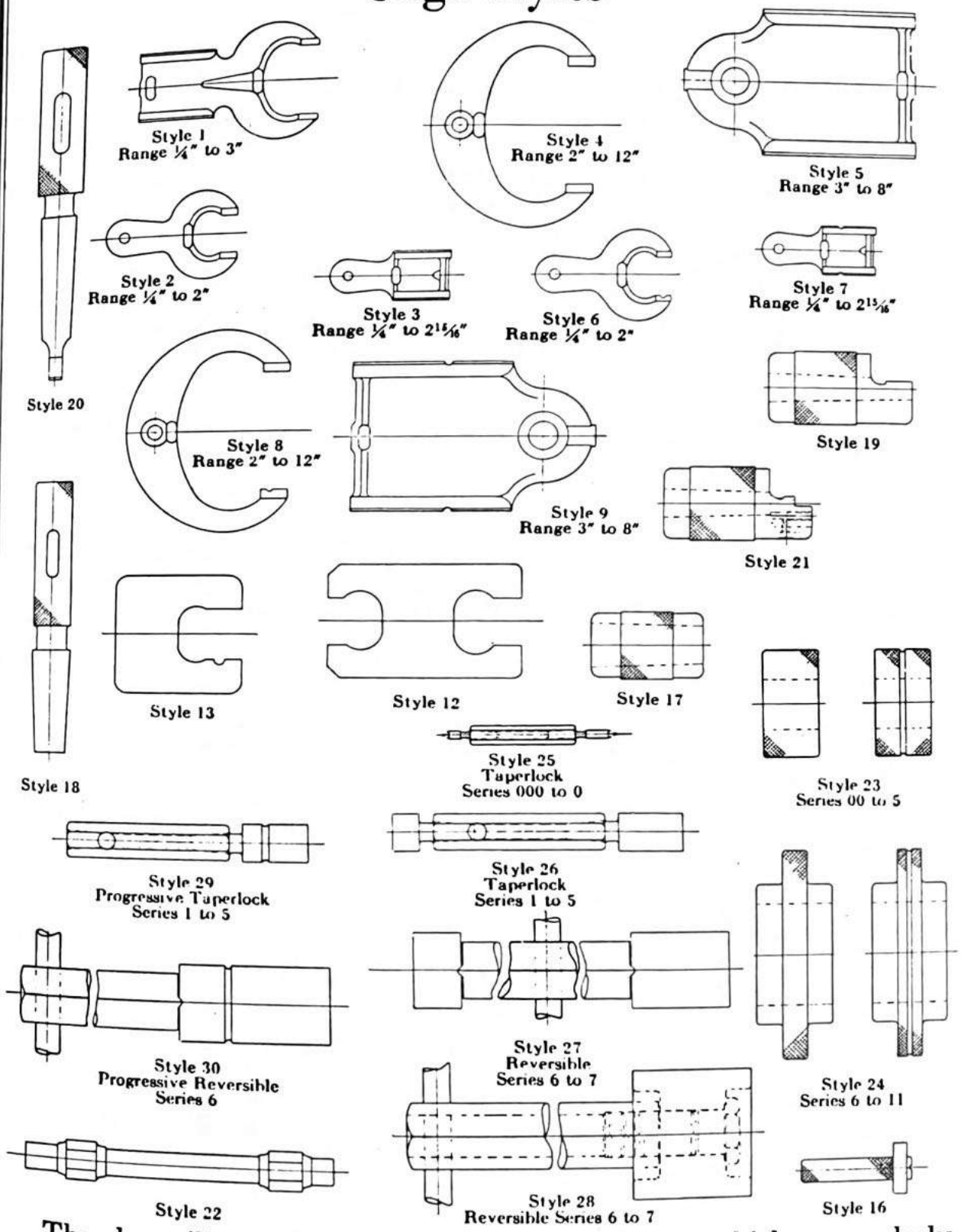
Style 4

Size, mm	Price, Each	Size, mm	Price, Each	Size, mm	Price, Each	Size, mm	Price, Each
79	$4.60	87	$4.90	95	$5.25	115	$5.95
80	4.60	88	4.90	96	5.60	120	5.95
81	4.60	89	5.25	97	5.60	125	5.95
82	4.60	90	5.25	98	5.60	130	6.30
83	4.90	91	5.25	99	5.60	135	6.30
84	4.90	92	5.25	100	5.60	140	6.30
85	4.90	93	5.25	105	5.95	145	6.30
86	4.90	94	5.25	110	5.95	150	6.30

Intermediate sizes, not listed between 100 mm and 150 mm, made to order.

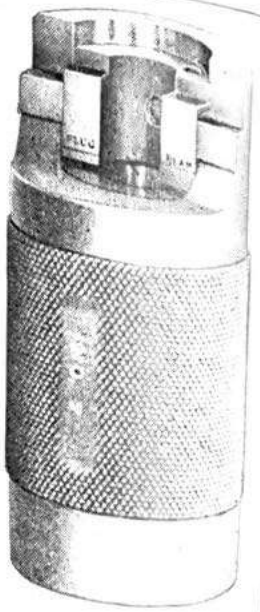
Each of the above packed one in a package.

Gage Styles



The above illustrations show some styles of gages which we regularly manufacture. Where range is not indicated beneath illustration, gage is made in size desired.

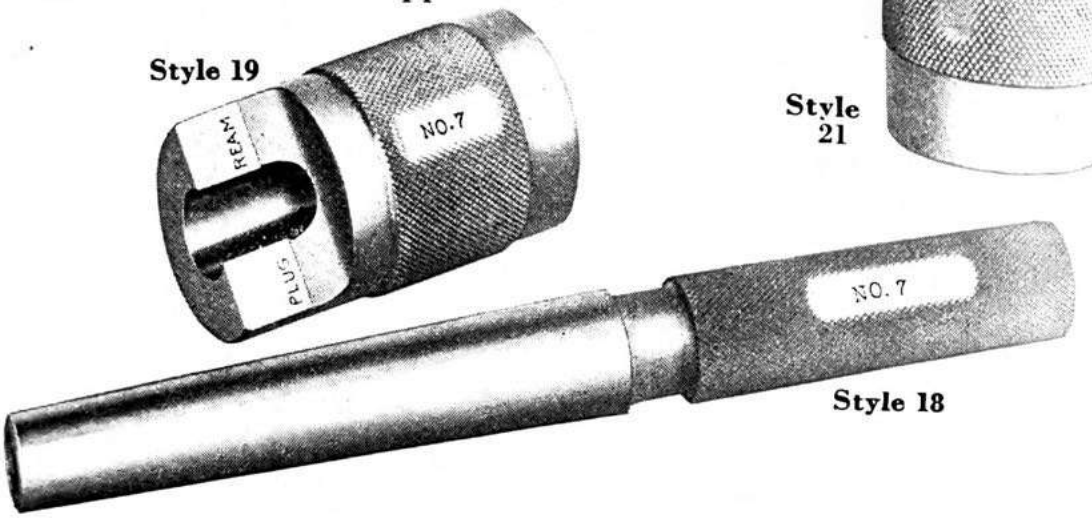
Cylindrical Taper Gages



Furnished promptly for any taper in styles shown or to customers' specifications. Hardened, ground and lapped. Measuring surfaces are long in proportion to size of gage. In style 21, hardened adjustable blocks indicate plug and reamer depths.

We are equipped to furnish gages for Milling Machine Standard Tapers.

Prices on application.



Style 19

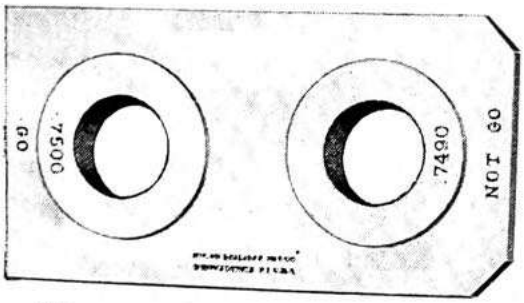
Style 21

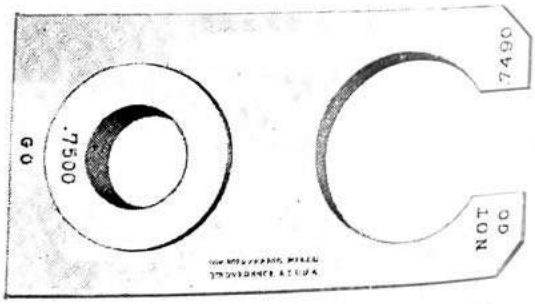
Style 18

Twin Ring Gages

Combination Ring and Snap Gages

(American Gage Design Standard)

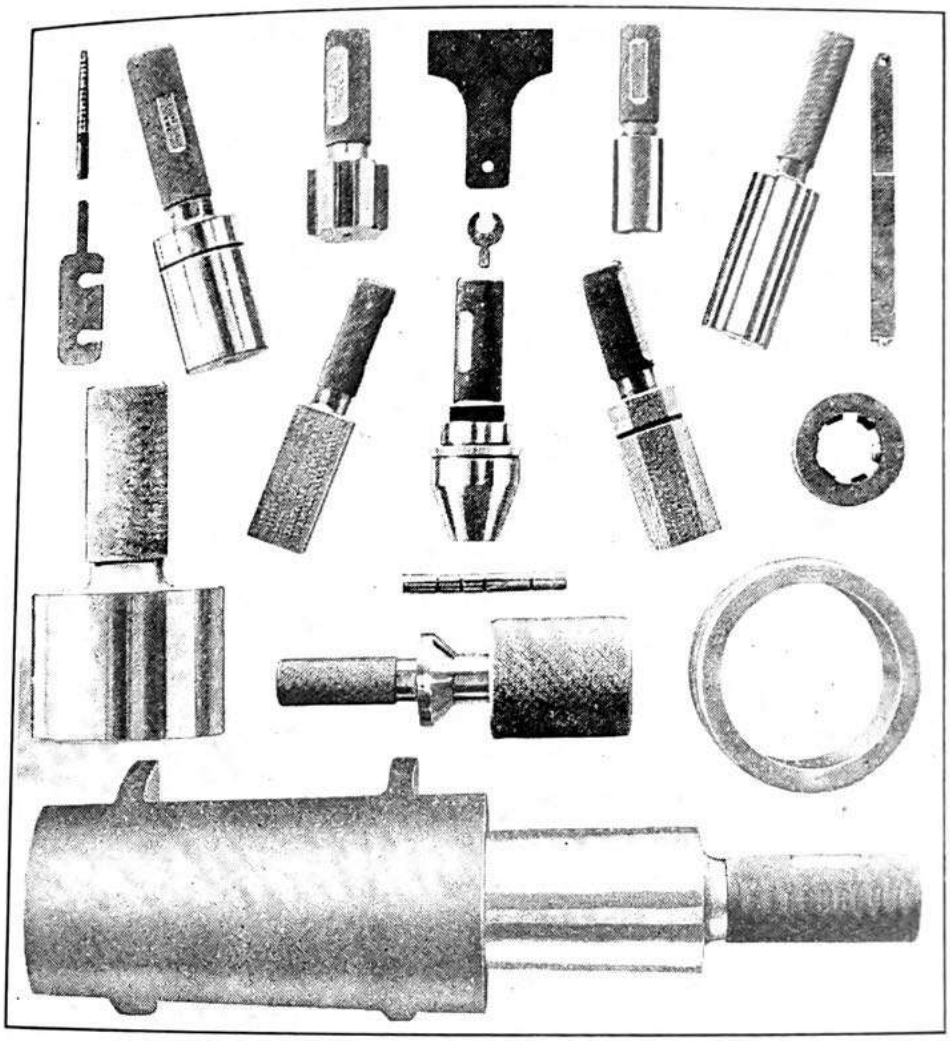




We are prepared to make gages shown above from 0.059″ to and including 1.135″ diameter. Prices on application.

Prices are quoted on Limit or Special Gages of all descriptions when specifications, drawings, or samples of work are sent. Dimensions required at each end of gage must be plainly stated in thousandths or fractions of thousandths of an inch.

Special Gages



The Brown & Sharpe Gage Department is equipped for the special requirements of accurate gage manufacture. Unusual items we have made include gages for plate glass, lumber, flooring, catgut, rubber rings, reed, wood, rubber threads, veneer, special tapers, shapes, spline shafts, and for hundreds of special purposes in machine work. We are prepared to recommend suitable gage equipment for manufactured products.

We are constantly alert to develop and apply new processes which will improve our gages. Our modern inspection equipment, which checks holes, forms, diameters and lengths to limits of accuracy impracticable a few years ago, is kept in a constant temperature room at 68° F., the temperature most generally recognized as standard for gaging and close measuring purposes.

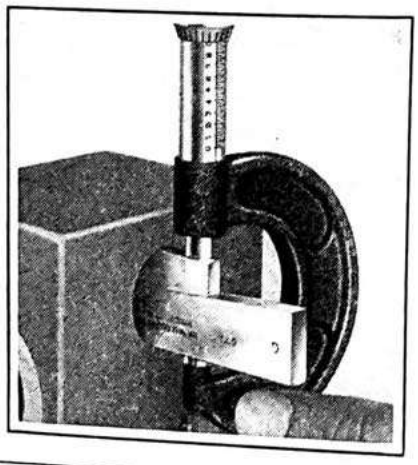
672

Taper Parallel Gages No. 672

Price, per Set, $20.00

To shops lacking full sets of plug gages, these Taper Parallel Gages offer an economical and convenient means of checking holes of any size from ¼″ to 1″. They also can be used instead of plugs when it is desired to check distances between holes.

To measure hole sizes as shown in illustration, two gaging pieces are inserted in the hole and expanded along the tapered surfaces. The diameter of the hole can then be obtained by measuring the Taper Parallel Gage pieces externally.



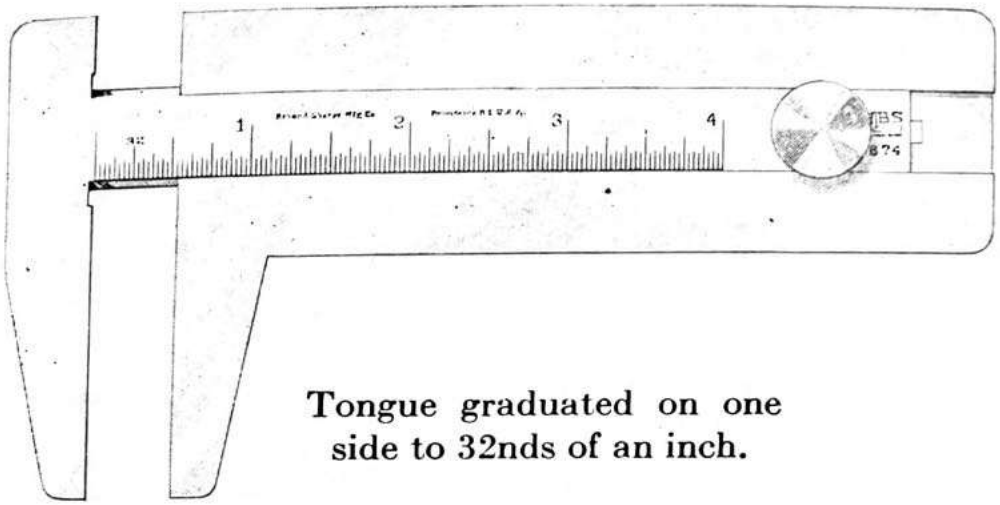
The set consists of 10 gages made of high grade tool steel hardened, and ground to very close limits. The measuring surfaces are ground on a radius according to the size of the holes in which they are to be used.

Gages are packed in a neat wooden case, and a plate in the cover gives the different ranges obtainable with different combinations of gages.

Packed one set in a box.

Rolling Mill Caliper Gage No. 674

674



Tongue graduated on one side to 32nds of an inch.

Price, $12.00

This rolling mill caliper gage is made of tool steel, drop-forged. It is especially strong to withstand the severe strains of use on a heavy class of work as in measuring sheet iron and steel in rolling mills. The jaws are hardened.

This gage is equally as useful in stock and store rooms but is designed especially to withstand the more severe requirements of heavy work.

This tool is $5\frac{13}{16}''$ long and $\frac{7}{32}''$ thick. The jaws are $2\frac{1}{8}''$ deep and can be drawn apart to measure 4″. The slide can be securely clamped in position by the **Clamp Nut.**

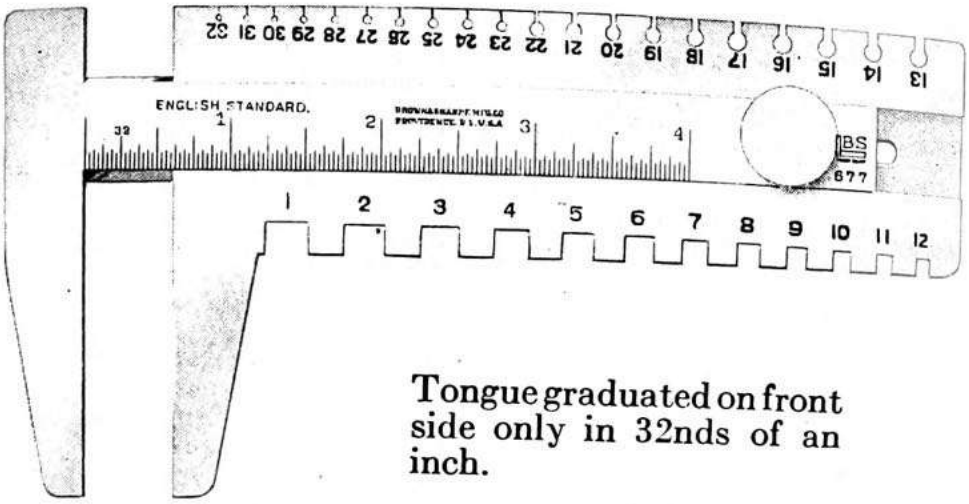
Packed one in a box.

Caliper and Wire Gage No. 677

ENGLISH OR BIRMINGHAM STANDARD

677

680



Tongue graduated on front side only in 32nds of an inch.

Numbers 1 to 32 Price, $16.00

This tool is found especially useful in the stock and store room for selecting iron, steel and sheet stock and for gaging wire.

It is made of steel, 5¾″ long and 3/16″ thick. The jaws are hardened and 2″ deep, and can be drawn apart to measure 4″. The slide can be clamped in position by the **clamp nut.** This gage is well adapted to measuring the width of thin stock, as there is no clearance at bottom of jaws near the tongue.

The gage numbers are of the English Standard Wire Gage, or Stubs' Iron Wire or Birmingham Gage (designate Stubs' soft wire sizes). For different gage sizes, see page 397.

Caliper Gage No. 680

U. S. STANDARD

Adopted by Congress, March 3, 1893

For Sheet and Plate Iron and Steel

Numbers 1 to 32 Price, $16.00

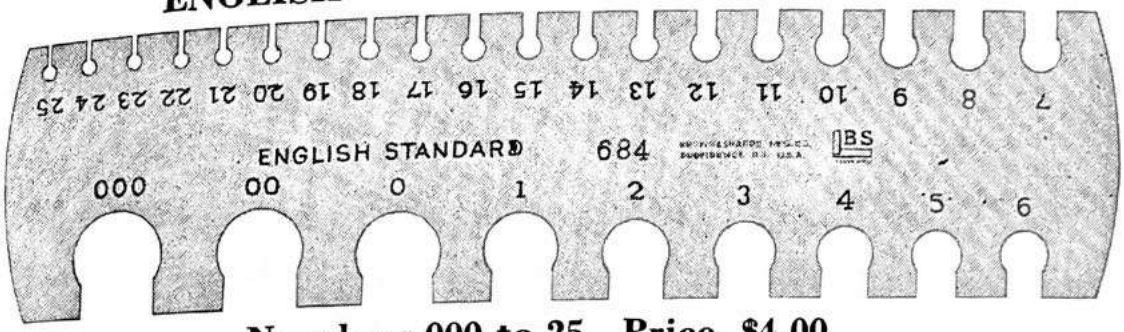
Tongue graduated on front side only in 32nds of an inch.

Similar in design to gage No. 677, but gage numbers are United States Standard, used for determining duties and taxes levied by the United States. This is a recognized commercial standard in the United States for uncoated sheet and plate iron and steel and is based on weights in ounces per square foot. For different gage sizes, see page 397.

Each of the above packed one in a box.

Rolling Mill Gage No. 684

ENGLISH OR BIRMINGHAM STANDARD



684

685

Numbers 000 to 25 Price, $4.00
Hardened

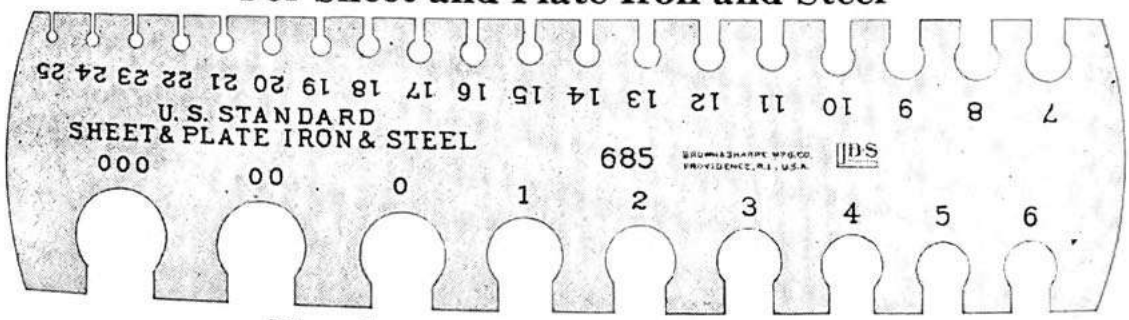
Especially adapted to withstand the rough usage a gage is likely to receive in rolling mills, or for use in other places where measurements are to be taken quickly. Gage is hardened steel, about 1/8″ thick.

Gage numbers are the English Standard Wire Gage, or Stubs' Iron Wire or Birmingham Gage, (designate the Stubs' Soft Wire sizes), and are used for gaging iron wire and for hot and cold rolled sheet steel. Also, in some cases, for gaging sheet iron. For different gage sizes, see page 397.

Rolling Mill Gage No. 685

U. S. STANDARD

Adopted by Congress, March 3, 1893
For Sheet and Plate Iron and Steel



Numbers 000 to 25 Price, $4.00
Hardened

Especially adapted to withstand the rough usage which a gage receives in rolling mills, or for use in other places where measurements are to be taken quickly. Gage is hardened steel about 1/8″ thick.

Gage numbers are United States Standard, used for determining duties and taxes levied by the United States. This is a recognized commercial standard in the United States for uncoated sheet and plate iron and steel, and is based on weights in ounces per square foot. For different gage sizes see page 397.

Each of the above packed six in a box.

American Standard Wire Gages No. 688

The generally accepted Standard for Non-Ferrous Metals
Adopted by the Brass Manufacturers, January, 1858

688

690

Hardened

This gage is particularly useful to electricians and others for gaging sheets, plates and wire of non-ferrous metal such as copper, brass, aluminum, etc. Screw Slotting Cutters are also made to this gage.

Decimal equivalents (approx.) are stamped on the reverse side.

Prices
Nos. 0 to 36, $3.00
Nos. 5 to 36, 2.50

For Different Gage Sizes, see page 397.

English Standard Wire Gages No. 690

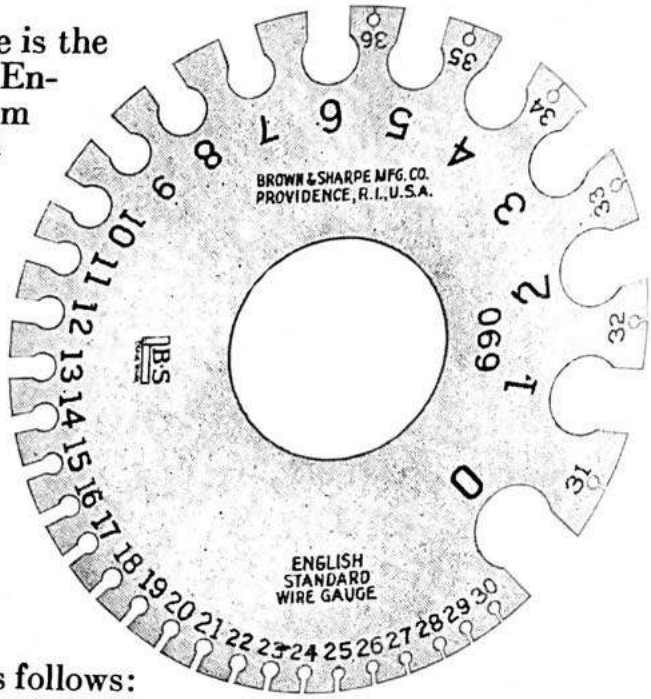
SAME AS STUBS' IRON WIRE OR BIRMINGHAM GAGE

Hardened

The Stubs' Iron Wire Gage is the one commonly known as the English Standard or Birmingham Gage (and designates the Stubs' Soft Wire Sizes).

It is used for gaging iron wire, and for hot and cold rolled sheet steel; also in some cases for gaging sheet iron.

Decimal equivalents are stamped on reverse side.



Prices
Nos. 0 to 36, $3.00
Nos. 5 to 36, 2.50

For Different Gage Sizes, see page 397.

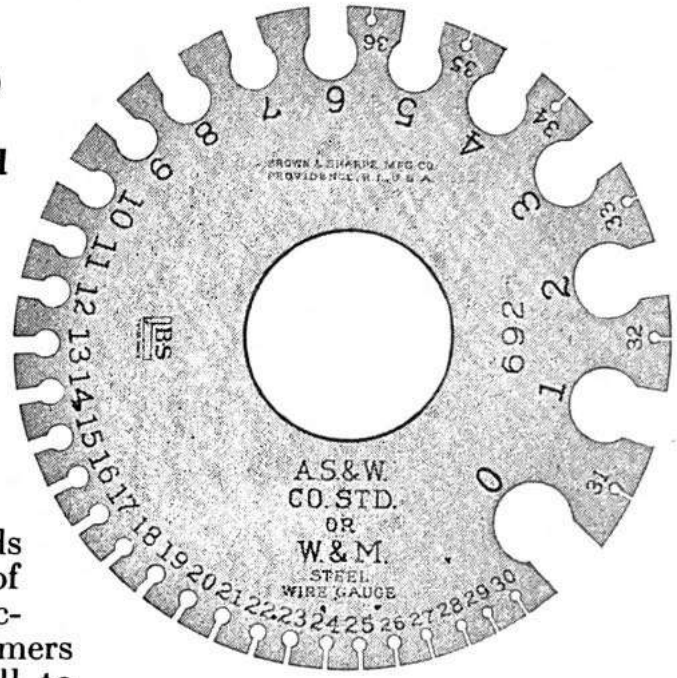
Each of the above packed as follows: Small size twelve, and large size six in a box.

Steel Wire Gage No. 692*

AMERICAN STEEL & WIRE CO.'S (WASHBURN & MOEN) STANDARD

Numbers 0 to 36, Hardened

Price, $3.00



692

694

For gaging steel wire and drill rod. For different gage sizes see page 397.

*Extract from a letter written by the Director, United States Bureau of Standards, July 7, 1911:

"Upon the recommendation of the Bureau of Standards at Washington, a number of the principal wire manufacturers and important consumers have agreed it would be well to designate this gage as the 'Steel Wire Gage'; . . . to distinguish it from the British Standard Wire Gage it may be called the 'United States Steel Wire Gage.' The name thus adopted has official sanction, although without legal effect."

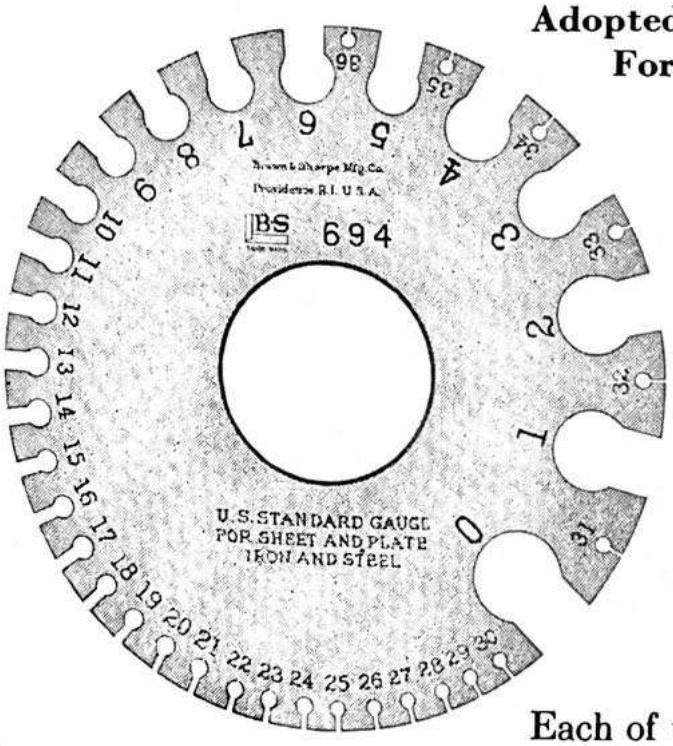
U. S. Standard Gage No. 694

Adopted by Congress, March 3, 1893

For Sheet and Plate Iron and Steel

Numbers 0 to 36, Hardened

Price, $3.00



Gage numbers are United States Standard, used for determining duties and taxes levied by United States. This is a recognized commercial standard in the United States for uncoated sheet and plate iron and steel and is based on weights in ounces per square foot. Decimal equivalents (approx.) stamped on reverse side. For different gage sizes see page 397.

Each of the above packed six in a box.

Steel Music Wire Gage No. 696

AMERICAN S. & W. CO.'S STANDARD

696

698 A

698 B

Numbers 000000 to 33

Price, $3.00

Hardened

Decimal equivalents stamped on reverse side.

This gage carries all sizes for measuring and checking steel music wire.

For different gage sizes, see page 397.

Packed six in a box.

Wire Gage Selectors Nos. 698A and 698B

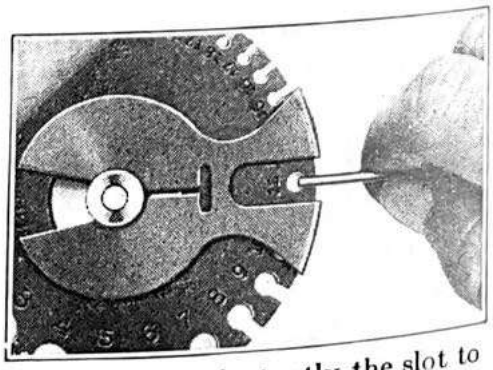
When snapped into a round wire gage, selector becomes part of gage and will not slip or come apart. Slots adjacent to one being used are covered up; desired slot only is left open. This facilitates the gaging of a large number of similar wires. There are no screws or nuts to become lost—a Brown & Sharpe feature.

Price

No. 698A, for use on Wire Gages Nos. 688 (5 to 36) and 690 (5 to 36) **$0.80**

No. 698B, for use on Wire Gages Nos. 688 (0 to 36), 690 (0 to 36), 692 and 694 . . . . . **.80**

Each of the above packed one in a package.



No. 698 shows instantly the slot to use when gaging similar wires.

Different Standards for Wire Gages

Dimensions of Sizes in Decimal Parts of an Inch

No. of Wire	American or Brown & Sharpe for Non-Ferrous Metals	Birmingham, or Stubs' Iron Wire	American S. & W. Co.'s (Washburn & Moen) Std. Steel Wire	American S. & W. Co.'s Music Wire	Imperial Wire	Stubs' Steel Wire	U. S. Std. Gage for Sheet & Plate Iron & Steel	No. of Wire
7-0's	.651354	..	.4900	..	.500	..	.500	7-0's
6-0's	.580049	..	.4615	.004	.464	..	.46875	6-0's
5-0's	.516549	.500	.4305	.005	.432	..	.4375	5-0's
4-0's	.460	.454	.3938	.006	.400	..	.40625	4-0's
000	.40964	.425	.3625	.007	.372	..	.375	000
00	.3648	.380	.3310	.008	.348	..	.34375	00
0	.32486	.340	.3065	.009	.324	..	.3125	0
1	.2893	.300	.2830	.010	.300	.227	.28125	1
2	.25763	.284	.2625	.011	.276	.219	.265625	2
3	.22942	.259	.2437	.012	.252	.212	.250	3
4	.20431	.238	.2253	.013	.232	.207	.234375	4
5	.18194	.220	.2070	.014	.212	.204	.21875	5
6	.16202	.203	.1920	.016	.192	.201	.203125	6
7	.14428	.180	.1770	.018	.176	.199	.1875	7
8	.12849	.165	.1620	.020	.160	.197	.171875	8
9	.11443	.148	.1483	.022	.144	.194	.15625	9
10	.10189	.134	.1350	.024	.128	.191	.140625	10
11	.090742	.120	.1205	.026	.116	.188	.125	11
12	.080808	.109	.1055	.029	.104	.185	.109375	12
13	.071961	.095	.0915	.031	.092	.182	.09375	13
14	.064084	.083	.0800	.033	.080	.180	.078125	14
15	.057068	.072	.0720	.035	.072	.178	.0703125	15
16	.05082	.065	.0625	.037	.064	.175	.0625	16
17	.045257	.058	.0540	.039	.056	.172	.05625	17
18	.040303	.049	.0475	.041	.048	.168	.050	18
19	.03589	.042	.0410	.043	.040	.164	.04375	19
20	.031961	.035	.0348	.045	.036	.161	.0375	20
21	.028462	.032	.0317	.047	.032	.157	.034375	21
22	.025347	.028	.0286	.049	.028	.155	.03125	22
23	.022571	.025	.0258	.051	.024	.153	.028125	23
24	.0201	.022	.0230	.055	.022	.151	.025	24
25	.0179	.020	.0204	.059	.020	.148	.021875	25
26	.01594	.018	.0181	.063	.018	.146	.01875	26
27	.014195	.016	.0173	.067	.0164	.143	.0171875	27
28	.012641	.014	.0162	.071	.0149	.139	.015625	28
29	.011257	.013	.0150	.075	.0136	.134	.0140625	29
30	.010025	.012	.0140	.080	.0124	.127	.0125	30
31	.008928	.010	.0132	.085	.0116	.120	.0109375	31
32	.00795	.009	.0128	.090	.0108	.115	.01015625	32
33	.00708	.008	.0118	.095	.0100	.112	.009375	33
34	.006304	.007	.0104	..	.0092	.110	.00859375	34
35	.005614	.005	.0095	..	.0084	.108	.0078125	35
36	.005	.004	.0090	..	.0076	.106	.00703125	36
37	.004453	..	.0085	..	.0068	.103	.00664063	37
38	.003965	..	.0080	..	.0060	.101	.00625	38
39	.003531	..	.0075	..	.0052	.099	....	39
40	.003144	..	.0070	..	.0048	.097	....	40

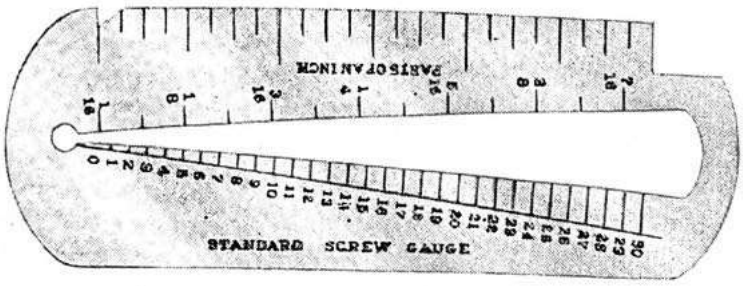
Stubs' Gages

The difference between the Stubs' Iron Wire Gage and the Stubs' Steel Wire Gage should be constantly borne in mind, the first being commonly known as the English Standard Wire, or Birmingham Gage, and which designates the Stubs' soft wire sizes, and the second being used in measuring drawn steel wire or drill rods of Stubs' make.

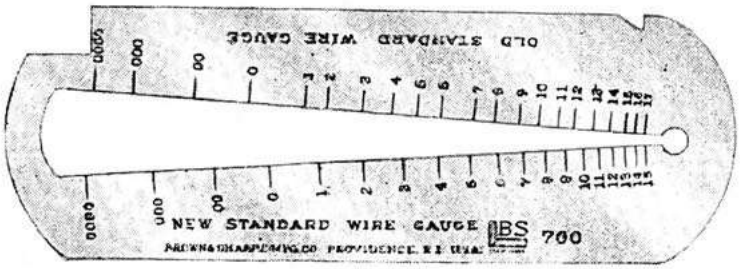
Pocket Screw and Wire Gage No. 700

Price, $3.00

700



Front Side



Back Side

Made of a good quality steel and carefully finished to size. Graduated on front and back.

Front side is graduated for all sizes of American Standard Screws, old style, from 0 to 30, and to measure diameters of wire or screws from 1/16″ to 7/16″.

Back side is graduated to measure the old or English wire gage, from 17 to 0000, and to measure the new or American wire gage from 15 to 0000.

This gage can be used, also, to show the numbered sizes of American National numbered screws from 0 to 30 as these sizes vary only slightly from the respective gage sizes of the American Standard screws, old style. (See table, pages 644 and 645.)

One edge is graduated in 1/8″ for measuring screws and angular and 90° slots permit the heads of flat or round headed screws to be placed against positive stops when being measured for these lengths.

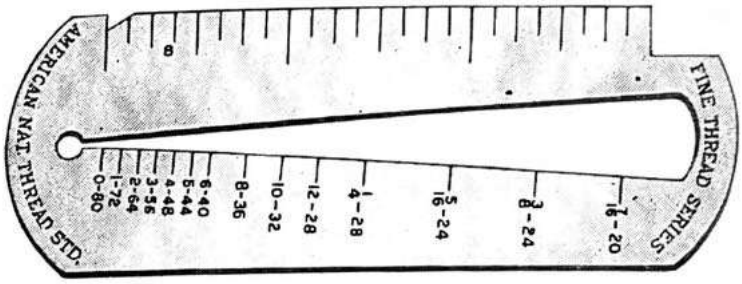
Gage is approximately 4″ long, 1 13/32″ wide and 3/64″ thick.

Packed six in a box.

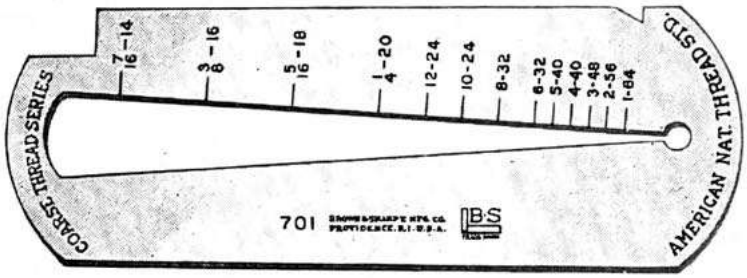
American National Standard Screw Gage No. 701

Price, $3.00

701



Front Side



Back Side

Made of a good quality steel and carefully finished to size. Graduated on front and back.

Front side graduated for fine thread series, and back side for coarse thread series, American National Standard.

American National Standard Wood Screws are the same size as American National Machine Screws and so can be sized equally well on this gage. (See table, pages 644 and 645.)

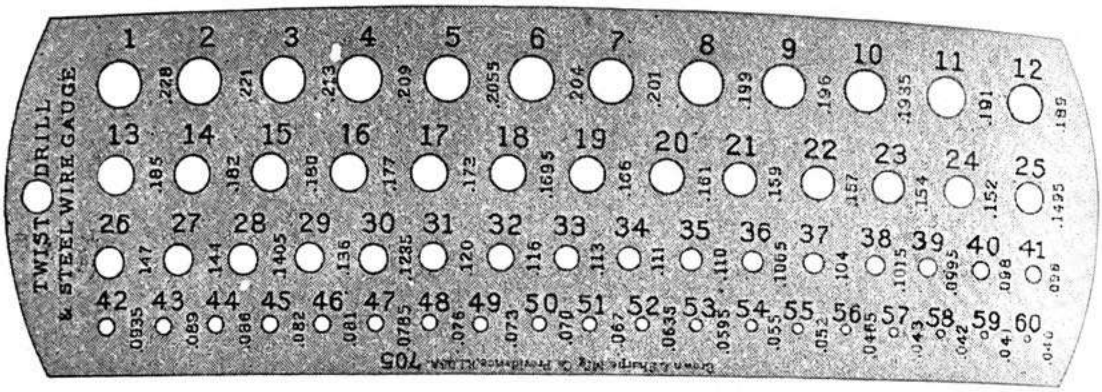
One edge is graduated in 1/8″ for measuring screws and angular and 90° slots permit the heads of flat or round headed screws to be placed against positive stops when being measured for their lengths.

Gage is approximately 4″ long, 1 13/32″ wide, and 3/64″ thick.

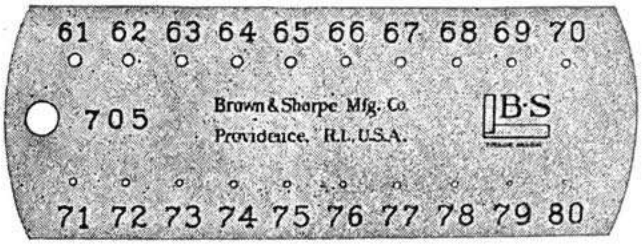
Packed six in a box.

705

Twist Drill and Steel Wire Gage No. 705



Nos. 1 to 60. Price, $2.00



Nos. 61 to 80. Price, $2.40

For use in determining the correct size of Twist Drills and Steel Drill Rods. Great care is taken to insure the accuracy of the gage numbers. All sizes are carefully tested after hardening.

The larger Gage is about 1/16″ thick, 1 5/8″ wide, 5 1/4″ long and contains gage numbers from 1 to 60, inclusive, with decimal equivalents of the various sizes stamped conveniently on the front side. The smaller Gage is about 1/16″ thick, 3/4″ wide, 2″ long and contains gage numbers from 61 to 80, inclusive.

For table of Decimal Equivalents of the Numbers of Twist Drill and Steel Wire Gage, see next page.

Each of the above packed six in a box.

Decimal Equivalents

of the

Numbers of Twist Drill and Steel Wire Gage

For measuring the sizes of twist drills and steel drill rods. Used almost universally in the United States for drill sizes. Rod sizes by this gage should not be confused with Stubs' Steel Wire Gage sizes. There is a slight difference between the sizes of corresponding numbers in the two gages for most of the sizes.

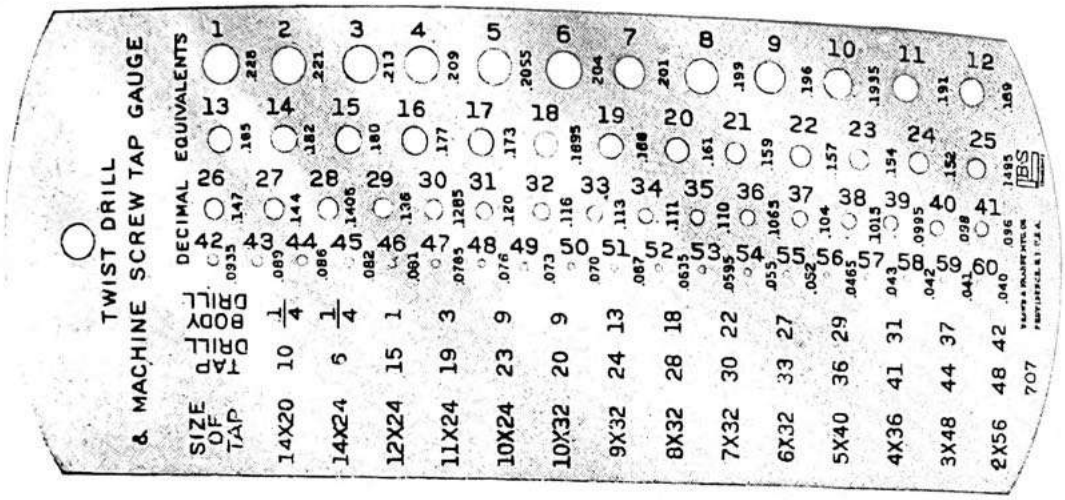
No.	Size of No. in Decimals	No.	Size of No. in Decimals	No.	Size of No. in Decimals	No.	Size of No. in Decimals
1	.2280	21	.1590	41	.0960	61	.0390
2	.2210	22	.1570	42	.0935	62	.0380
3	.2130	23	.1540	43	.0890	63	.0370
4	.2090	24	.1520	44	.0860	64	.0360
5	.2055	25	.1495	45	.0820	65	.0350
6	.2040	26	.1470	46	.0810	66	.0330
7	.2010	27	.1440	47	.0785	67	.0320
8	.1990	28	.1405	48	.0760	68	.0310
9	.1960	29	.1360	49	.0730	69	.02925
10	.1935	30	.1285	50	.0700	70	.0280
11	.1910	31	.1200	51	.0670	71	.0260
12	.1890	32	.1160	52	.0635	72	.0250
13	.1850	33	.1130	53	.0595	73	.0240
14	.1820	34	.1110	54	.0550	74	.0225
15	.1800	35	.1100	55	.0520	75	.0210
16	.1770	36	.1065	56	.0465	76	.0200
17	.1730	37	.1040	57	.0430	77	.0180
18	.1695	38	.1015	58	.0420	78	.0160
19	.1660	39	.0995	59	.0410	79	.0145
20	.1610	40	.0980	60	.0400	80	.0135

Twist Drill and Machine Screw Tap Gage No. 707

Price, $2.40

707

710



Hardened

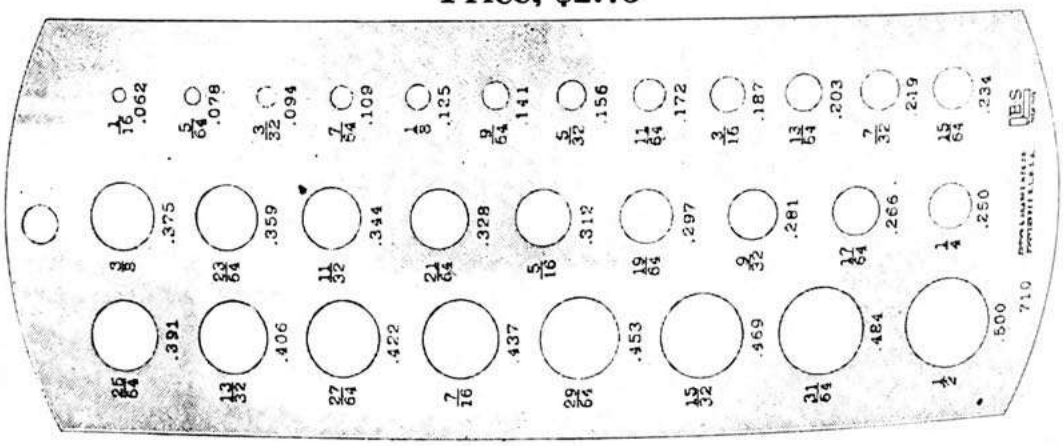
Tells at a glance correct drill for any common size machine screw tap. Carefully tested after hardening.

Gage is about 1/16″ thick, 2 5/8″ wide, 6 1/8″ long and is polished. Table gives size of tap, pitch of thread and size of drill required and size of drill for making hole through which outside diameter of tap will pass.

For table of decimal equivalents of the numbers of Twist Drill and Steel Wire Gage, see page 401.

Jobbers' Drill Gage No. 710

For Gaging Twist Drills
Price, $2.75



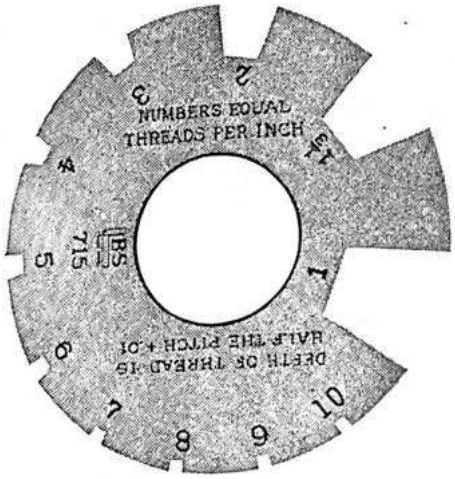
Hardened

The sizes are carefully tested for accuracy after hardening. This gage is polished and has decimal equivalents stamped on its front side. Gage is about 1/16″ thick, 2 3/8″ wide and 6 1/4″ long.

Each of the above packed six in a box.

29° Screw Thread Tool Gage No. 715

Acme Standard



Price, $3.30

Hardened

This gage furnishes a correct standard to which thread tools can be ground to cut threads of a uniform angle to take the place of square threads and to standardize the threads of various angles and depths now in use. The Acme thread has the same depth as the square thread, but is stronger. 715 716

The sides are at an inclination of 14½°, or 29° included angle, which angle is the same as is now generally adopted in cutting worms. (See page 404.)

A tool setting gage is furnished and included in the price of each gage.

Packed six in a box.

29° Screw Thread Tool Gage No. 716

Acme Standard

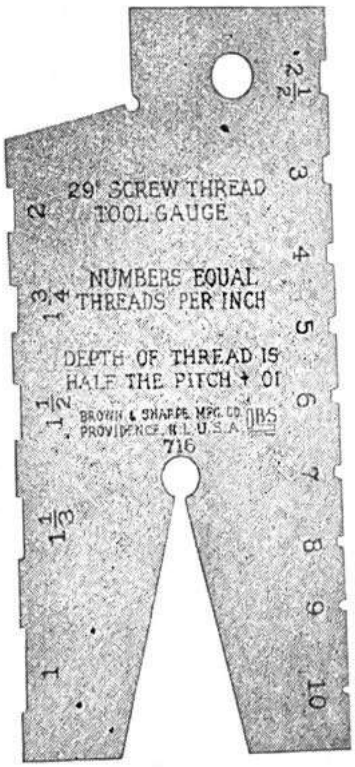
Price, $3.00

Hardened

This gage furnishes a correct standard to which thread tools can be ground for cutting threads of a uniform angle to take the place of square threads.

The Acme thread has the same depth as the square thread, but as the sides are at an inclination of 14½° (29° included angle) this form of thread is stronger. (See page 404.)

Packed twelve in a box.



29° Screw Thread

ACME STANDARD

The various parts of the 29° Screw Thread, Acme Standard, are obtained as follows:

Width of Point of Tool for Screw or Tap Thread =

$$\frac{.3707}{\text{Threads per inch}} - .0052.$$

$$\text{Width of Screw or Nut Thread} = \frac{.3707}{\text{Threads per inch}}$$

Diameter of Tap = Diameter of Screw + .020

Diameter of Tap or Screw at Root =

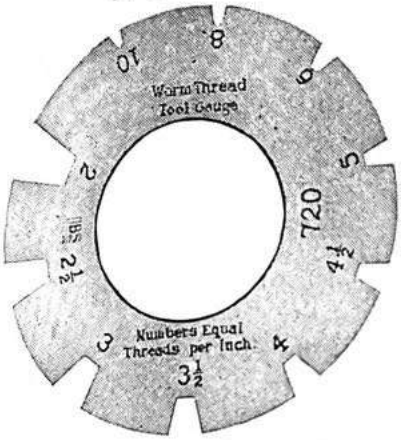
$$\text{Diameter of Screw} - \left(\frac{1}{\text{Threads per inch}} + .020\right)$$

$$\text{Depth of Thread} = \frac{1}{2 \times \text{Threads per inch}} + .010$$

Thread Dimensions—(For Gages see page 403)

Threads per Inch	Depth of Thread, Inches	Thickness at Top of Thread, Inches	Width Space at Bottom of Thread, Inches	Space at Top of Thread, Inches	Thickness at Root of Thread, Inches
1	.5100	.3707	.3655	.6293	.6345
1 1-3	.3850	.2780	.2728	.4720	.4772
2	.2600	.1853	.1801	.3147	.3199
3	.1767	.1235	.1183	.2098	.2150
4	.1350	.0927	.0875	.1573	.1625
5	.1100	.0741	.0689	.1259	.1311
6	.0933	.0618	.0566	.1049	.1101
7	.0814	.0529	.0478	.0899	.0951
8	.0725	.0463	.0411	.0787	.0839
9	.0655	.0413	.0361	.0699	.0751
10	.0600	.0371	.0319	.0629	.0681

Worm Thread Tool Gage No. 720



Price, $3.00
Price, With Tool Setting Gage, $3.30
Hardened

720

724

Furnishes the correct form for tools used in turning the threads of worms when the worm wheels are cut with involute cutters. The figures on the gage correspond to the number of threads per inch of the worm.

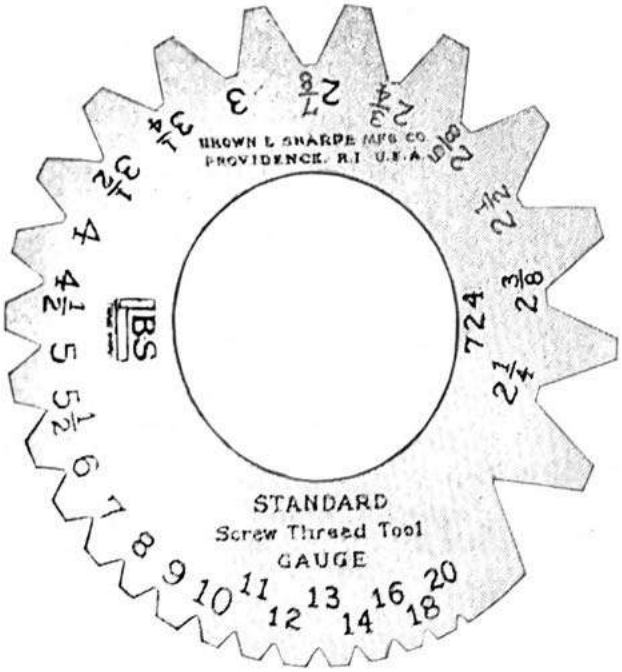
American National and U. S. Standard Screw Thread Tool Gage No. 724

Price, $3.50

Hardened

This gage is used as a standard for grinding tools to cut threads according to the American National and United States Standard.

The angles are 60°, and the flat surfaces at top and bottom of threads are equal to one eighth of the pitch.



Each of the above packed six in a box.

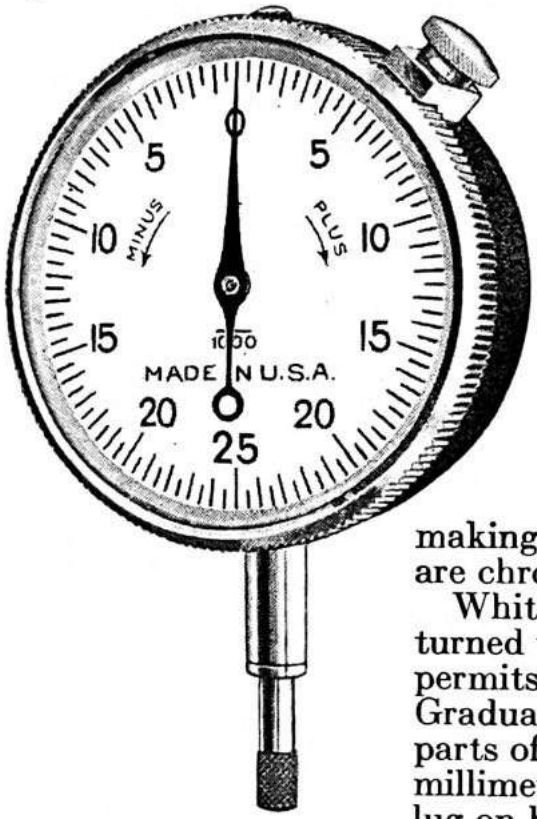
Dial Gage No. 726

For Dial Test Indicators
Price, $12.50

***ENGLISH MEASURE** or ***METRIC MEASURE**
Spindle Movement 3-10″ **Spindle Movement 7 mm**
by half-thousandths of an inch by hundredths of a millimeter

726

726 A



Can be attached to any of our indicators, with exception of No. 740, which requires a smaller gage. Also used on special attachments for testing purposes on machine or bench work.

Gears, pinions, screws and racks are made of stainless steel, insuring long and unusual durability. Stem is cast integral with case, eliminating soldered joints. Great care is taken in hobbing the gears and pinions, to further insure accuracy. The movement is an individual unit, as in watches, simplifying cleaning and making indicator shock proof. Exposed parts are chromium plated or enamelled.

White enamel dial face and bezel can be turned to bring zero under hand. Bezel clamp permits clamping dial in any desired position. Graduations are widely spaced and fractional parts of half-thousandths, or hundredths of a millimeter are readily estimated. Gages have lug on back with 3/16″ hole (approx.). Point of gage can be removed and points of different forms and lengths used. Dial is 2 7/32″ in diameter.

*Can be furnished with 1/2″ or 12 1/2 mm spindle movements. Price on application.

Dial Gage No. 726A—For Dial Test Indicators

Has jeweled bearings; Spindle movement .020″ by ten-thousandths as well as thousandths of an inch.
Price, $37.50

For use where inspection, testing, etc., are held to very close limits. Jeweled bearings insure smooth, even action and long life. This gage is recommended for use only with Brown & Sharpe Dial Indicators Nos. 731 and 731A, and other indicators of the more rigid type. The point of the gage is removable and points of different forms and lengths can be used.

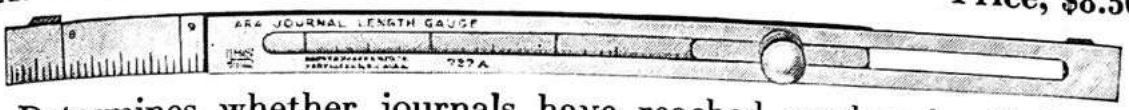
Dial Face may be turned to bring zero under index pointer. Bezel Clamp permits dial to be locked in position desired. Gages are regularly furnished with lug on back with 3/16″ hole. Dial is 2 7/32″ in diameter.

Each of the above packed one in a box.

Journal Length Gage No. 727A

(A. R. A. Standard)

Price, $8.50



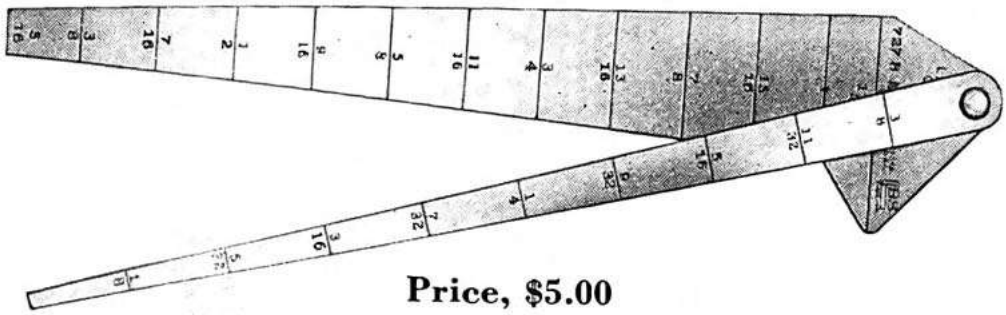
Determines whether journals have reached condemning limit and is so constructed that it can be extended to full authorized maximum length of 12⅝″. Made of steel, dull nickel plated and rust proof. Contact surfaces hardened. Checked for exact conformity with A. R. A. Standards.

Packed one in a box.

727 A

Lateral Gage No. 727B

727 B



728 A

Price, $5.00

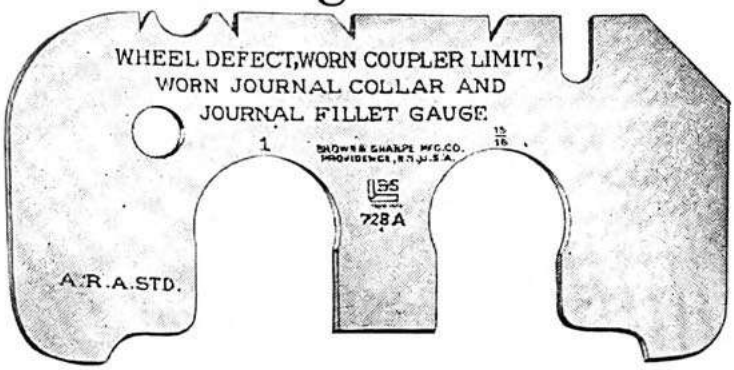
Determines clearances in places not readily accessible; as lateral motion between hubs and journal boxes, crosshead and guide, etc. Tapered blades give dimension at point of contact. One blade measures from ⅛″ to ⅜″ by 32nds; the other from 5/16″ to 1″ by 16ths. Wide end measures 1½″. Gage is cadmium plated and rust proof. Made of hardened steel and accurately graduated.

Packed one in a box.

Wheel Defect, Worn Coupler Limit, Worn Journal Collar and Journal Fillet Gage No. 728A

(A. R. A. Standard)

Price, $3.00



Hardened

Determines extent of defects and wear in car wheels, journal collars and couplers. Hardened steel, chromium plated. Measuring surfaces are accurately ground and finished. Packed six in a box.

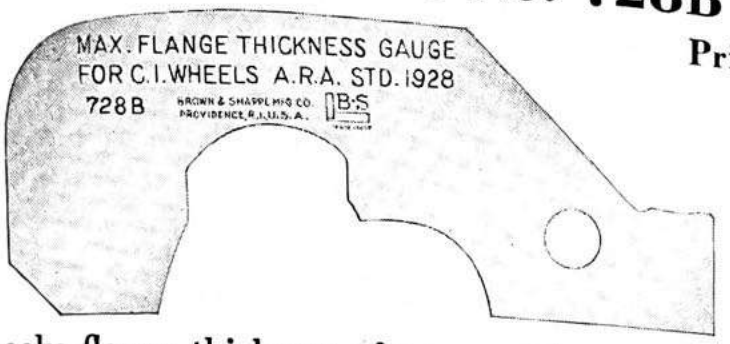
Maximum Flange Thickness Gage for Cast Iron Wheels No. 728B

(A. R. A. Standard)

Price, $7.50

728 B

Hardened



728 C

Accurately checks flange thickness of new cast iron wheels. If wheel size is correct, gage goes down over flange with leg flat on tread. Made of hardened steel, accurately finished and chromium plated. Checked for exact conformity to A. R. A. Standards.

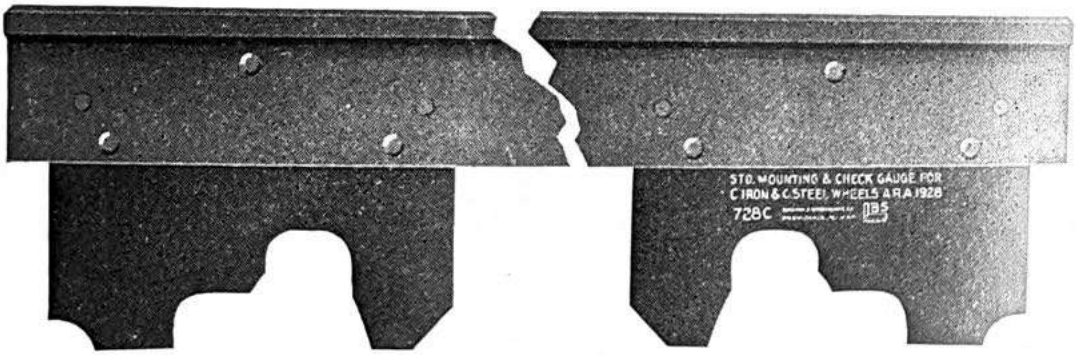
728 D

Packed six in a box.

Mounting and Check Gage for Cast Iron and Cast Steel Wheels No. 728C

(A. R. A. Standard)

Price, $30.00



Hardened Gages

Checks mounting of cast iron and cast steel wheels. Construction provides rigidity with least possible weight. Gages are hardened steel; tie bar is T section. Gages are riveted to tie bar. Checked for exact conformity to A. R. A. Standards.

Packed one in a box.

Coupler Contour Gage No. 728D

(A. R. A. Standard) **Hardened**

Price, $2.00

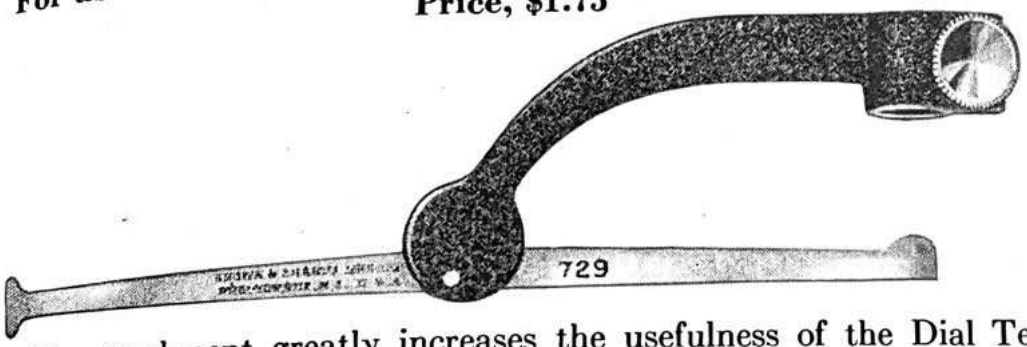
Determines accurately when Coupler Contour should be condemned. Made of hardened steel and chromium plated.

Packed six in a box.

Dial Test Indicator Attachment No. 729

For use with Dial Test Indicators Nos. 730, 731, 731A and 733

Price, $1.75



729

This attachment greatly increases the usefulness of the Dial Test Indicator by adapting it for testing internal and other surfaces that cannot be reached conveniently with the straight spindle of the dial gage.

The attachment is easily and quickly attached and firmly held by a knurled clamp screw.

Packed one in a box.

Angular Base Stops

For Dial Test Indicators Nos. 730, 731 and 731A

Price, $1.00 each

With this Stop, Indicator can be located from dovetail or angular surface. Ends of legs are rounded for use against such surfaces. One size for No. 730 Indicator; one size for No. 731 or 731A Indicator.

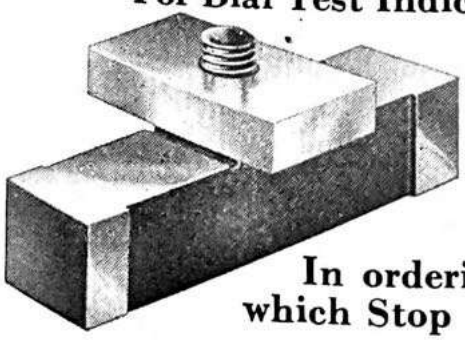
In ordering specify number of Indicator on which Stop is to be used.

Packed one in a package.

Plain Base Stops

For Dial Test Indicators Nos. 730, 731 and 731A

Price, $1.25 each



With this Stop, Indicator can be located from "T" slots and square edges. One size for No. 730 Indicator; one size for No. 731 or 731A Indicator.

In ordering specify number of Indicator on which Stop is to be used.

Packed one in a package.

Dial Test Indicator No. 730

Patent Pending

ENGLISH MEASURE —or— **METRIC MEASURE**

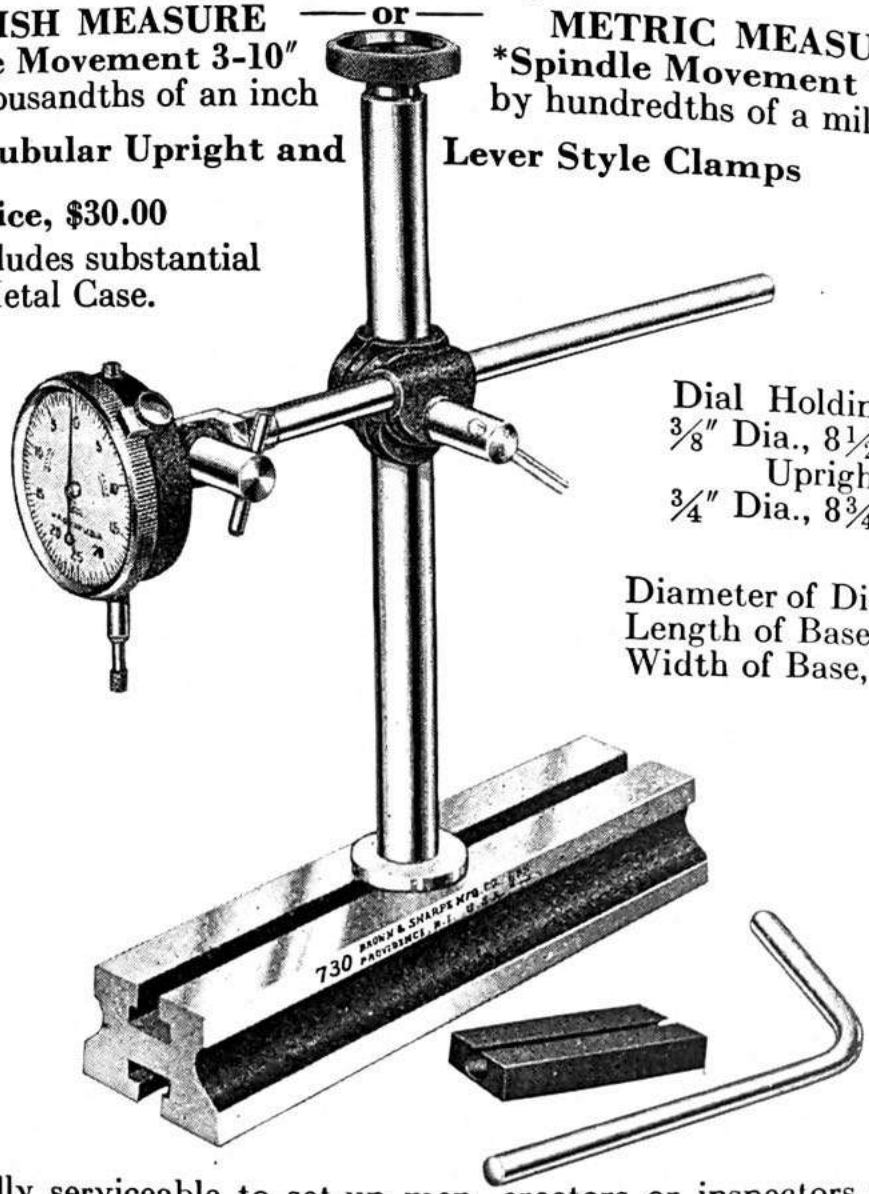
***Spindle Movement 3-10″** by half-thousandths of an inch

***Spindle Movement 7 mm** by hundredths of a millimeter

Has Tubular Upright and Lever Style Clamps

730 **Price, $30.00**

Price includes substantial Metal Case.



Dial Holding Rod
3/8″ Dia., 8 1/2″ Long
Upright
3/4″ Dia., 8 3/4″ Long

Diameter of Dial, 2 7/32″
Length of Base, 8 1/2″
Width of Base, 2 1/4″

Especially serviceable to set-up men, erectors or inspectors of machines for determining accuracy of a surface, spindle, arbor, etc.; and to toolmakers for obtaining comparative measurements on close work.

Upright is large diameter and tubular. Very rigid. Knurled nut at top of upright conveniently clamps it to base. Horizontal arm is adjustable to any angle; can be removed and used independently as in lathe tool post. Lever style clamps permit quick, positive adjustments. Tool Post Clamp and Slide Support Rod included in price. For description of dial gage furnished with this Indicator, see Dial Gage No. 726, page 406.

For Base Stops and Separate Parts, see pages 409 and 413.

Packed one in a box.

*Can be furnished with 1/2″ or 12 1/2 mm spindle movements. Price on application.

Dial Test Indicator No. 731

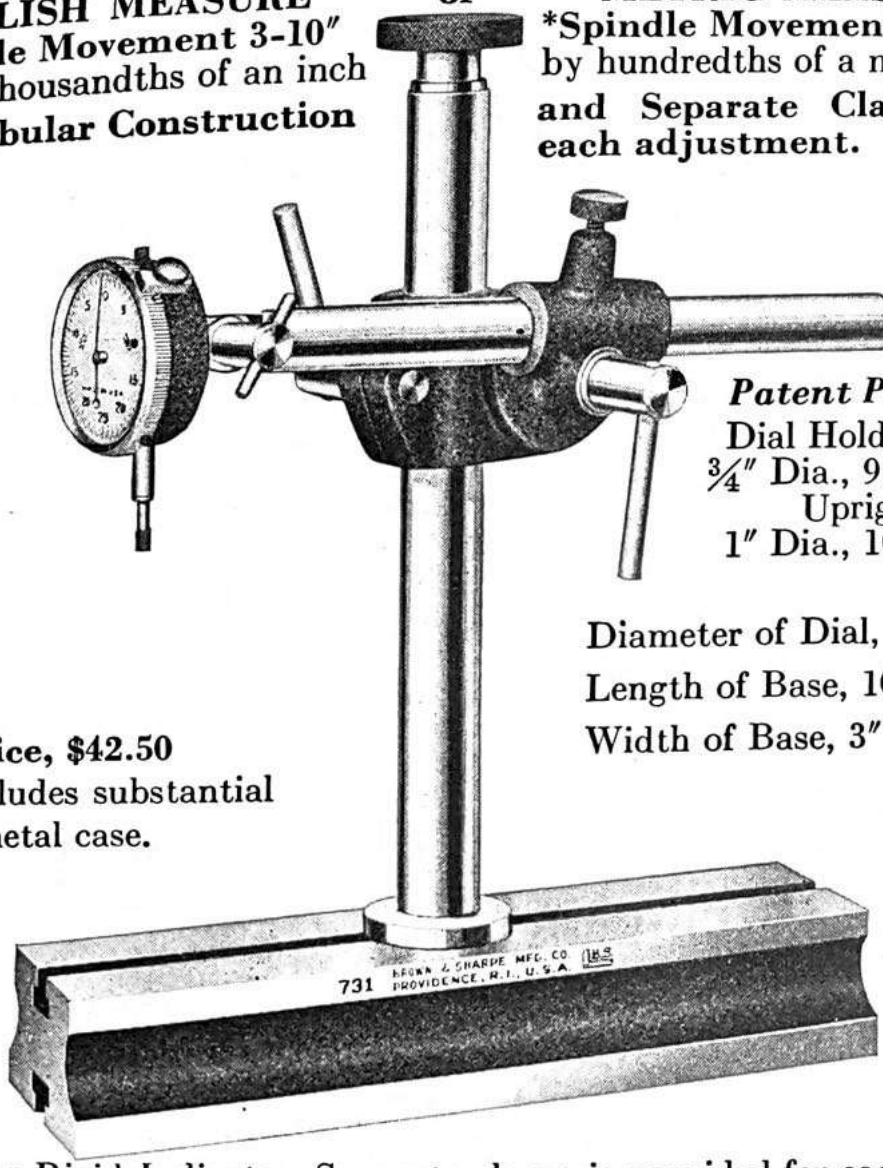
ENGLISH MEASURE
***Spindle Movement 3-10″**
by half-thousandths of an inch
Has Tubular Construction

or

METRIC MEASURE
***Spindle Movement 7 mm**
by hundredths of a millimeter
and Separate Clamp for each adjustment.

731

731 A



Patent Pending
Dial Holding Rod
¾″ Dia., 9⅝″ Long
Upright
1″ Dia., 10″ Long

Diameter of Dial, 2⁷⁄₃₂″
Length of Base, 10″
Width of Base, 3″

Price, $42.50
Price includes substantial metal case.

A Super-Rigid Indicator. Separate clamp is provided for each movement. Individual adjustments can be made without disturbing the other settings. Lever style clamps permit easy, secure clamping. Upright and dial holding rods are large diameter and tubular—strong and light—indicator is easy to handle. For Description of Dial Gage, see No. 726, page 406. For Base Stops and Separate Parts, see pages 409 and 413.

Dial Test Indicator No. 731A

Spindle Movement .020″ by ten-thousandths of an inch
Has Jeweled Bearings. Price includes substantial metal case. **Price, $67.50**

Similar to No. 731, except that dial gage is graduated to .0001″. (See No. 726A, page 406.) For work where extreme accuracy is required.

Each of the above packed one in a box.

***Can be furnished with ½″ or 12½ mm spindle movements. Price on application.**

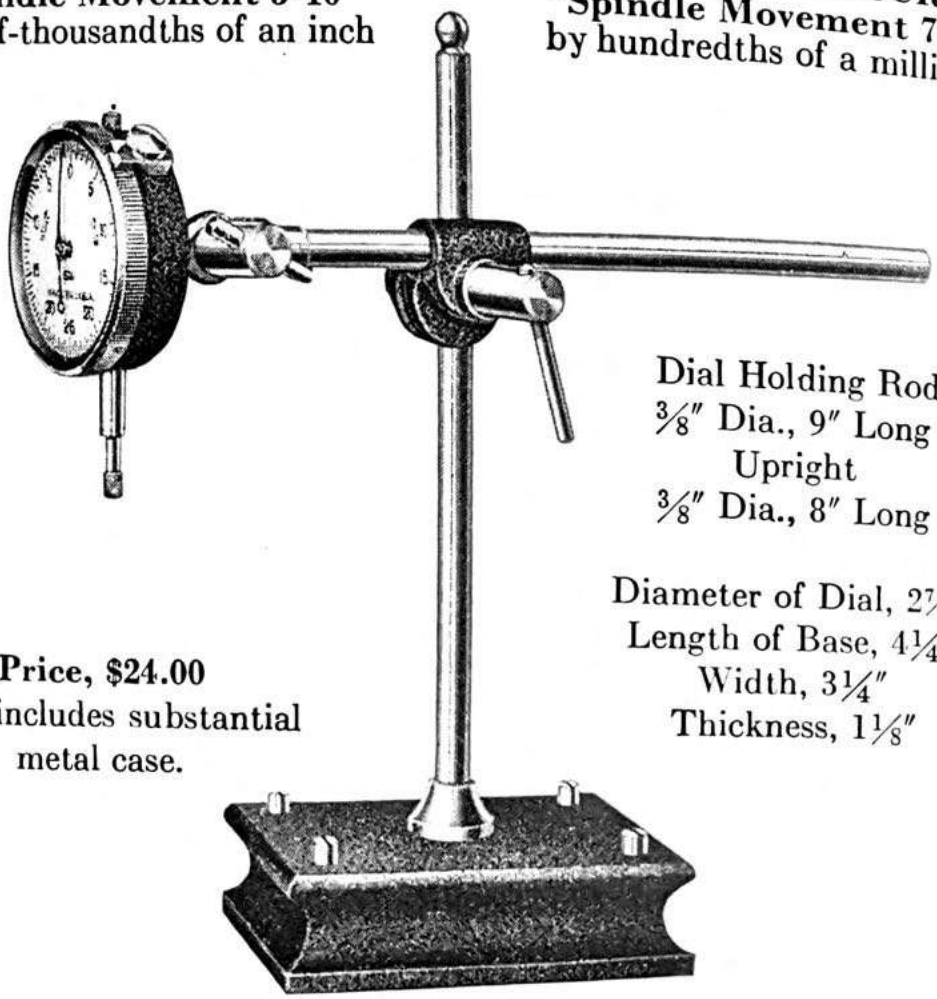
Dial Test Indicator No. 733

ENGLISH MEASURE
***Spindle Movement 3-10″**
by half-thousandths of an inch

or

METRIC MEASURE
***Spindle Movement 7 mm**
by hundredths of a millimeter

733



Dial Holding Rod
3/8″ Dia., 9″ Long
Upright
3/8″ Dia., 8″ Long

Diameter of Dial, 2 7/32″
Length of Base, 4 1/4″
Width, 3 1/4″
Thickness, 1 1/8″

Price, $24.00
Price includes substantial metal case.

This gage is especially recommended for use in the Motor Service Shop for testing camshafts and crankshafts for out-of-roundness and for setting crankshafts in grinding machines and accurately setting a flywheel in the lathe preparatory to turning off the old gear teeth when a new gear ring is to be put on.

The design of the base makes it very handy and is sufficiently heavy to give it a firm support. It has four gage pins at the corners that can be pushed down and used against a surface plate, straight edge or against the side of a T slot. For complete description of dial gage furnished with this Indicator, see Dial Gages No. 726 shown on page 406.

For Separate Parts, see page 413.

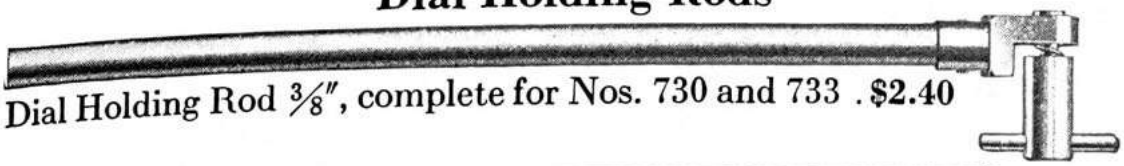
Each of the above packed one in a box.

***Can be furnished with 1/2″ or 12 1/2 mm spindle movements. Price on application.**

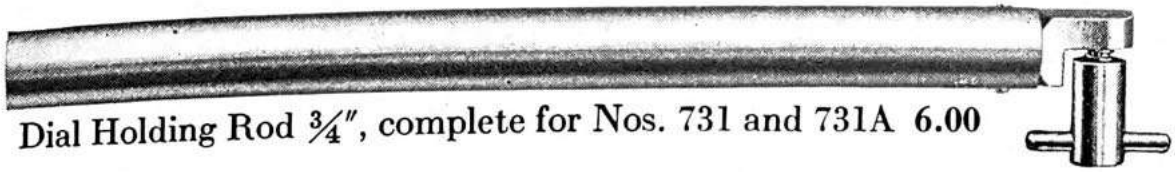
Separate Parts for Dial Test Indicators

These Dial Test Indicator parts are readily adaptable and useful for many types and combinations of special tools and fixtures.

Dial Holding Rods



Dial Holding Rod 3/8", complete for Nos. 730 and 733 . **$2.40**

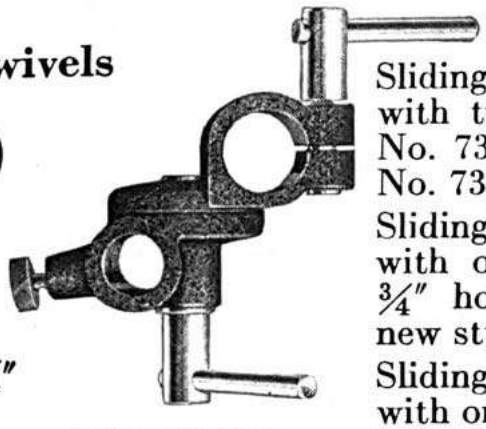


Dial Holding Rod 3/4", complete for Nos. 731 and 731A **6.00**

Sliding Swivels

3/8" Holes

3/8" & 3/4" Holes



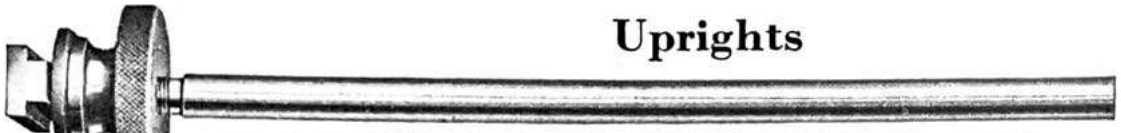
3/4" & 1" Holes

Sliding Swivel complete with two 3/8" holes for No. 730, old style, and No. 733 . . . . . **$2.75**

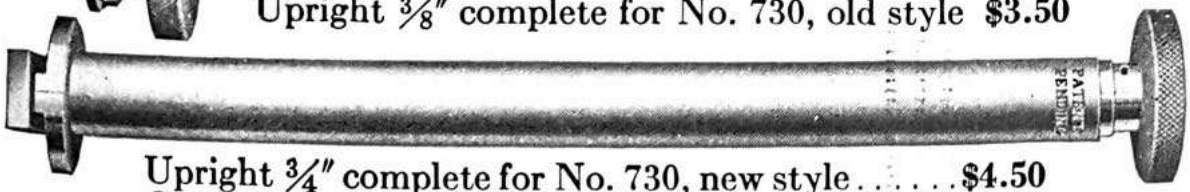
Sliding Swivel complete with one 3/8" and one 3/4" hole for No. 730, new style **2.75**

Sliding Swivel complete with one 3/4" and one 1" hole for Nos. 731 and 731A **8.25**

Uprights



Upright 3/8" complete for No. 730, old style **$3.50**



Upright 3/4" complete for No. 730, new style **$4.50**
Can be used with No. 730 bases formerly equipped with 3/8" Rods.

Upright 1" complete for Nos. 731 and 731A **6.75**
Interchangeable with 3/8" Uprights in old No. 732 Indicators.

This makes it possible to modernize old style No. 730 and No. 732 Dial Test Indicators without purchasing new bases.

Each of the above packed one in a box.

Other parts not listed above shown in separate folder sent on request.

Universal Attachment No. 734

For Use on Dial Test Indicators Nos. 730, 731, 731A and 733

734

734 A

Designed for testing internal and other surfaces that cannot be reached conveniently with the regular straight spindle of the dial gage.

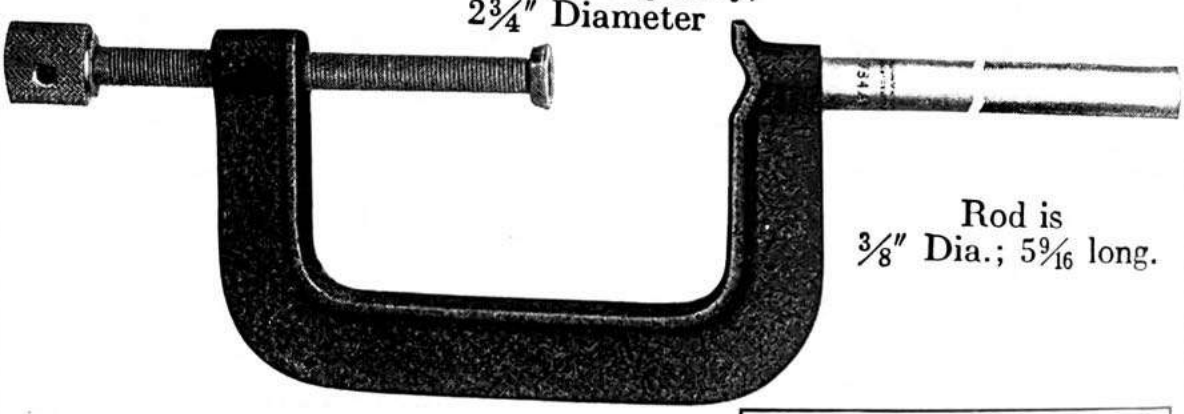
It consists of a small cylinder that clamps over the end of the dial gage spindle. Inside the cylinder a rod rests against the dial gage point. This rod is actuated by the bell crank point that extends at right angles to the regular spindle. The rod is so placed that it produces a direct thrust against the end of the spindle without affecting the sensitivity of the instrument.

Price, $4.50

Clamp Attachment No. 734A

For Use with Dial Test Indicator No. 733
Price, $3.00

Maximum Capacity,
2¾″ Diameter

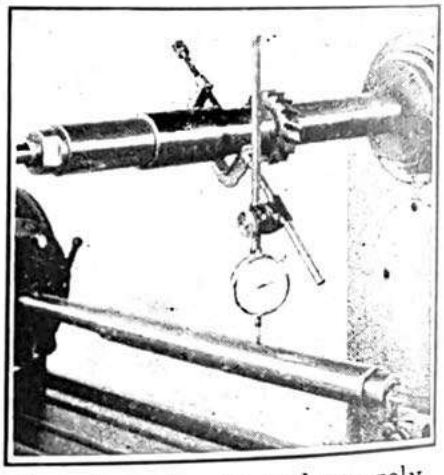


Rod is
⅜″ Dia.; 5⁹⁄₁₆ long.

This attachment is for use in holding dial indicator swivel and arm to arbor, spindle or similar machine member, while checking runout of parts, alignment of fixtures, etc.

The brass shoe on the end of the bolt swivels to prevent injury to a finished surface.

Can be used also with No. 730 and other indicators which have swivel for post ⅜″ diameter.

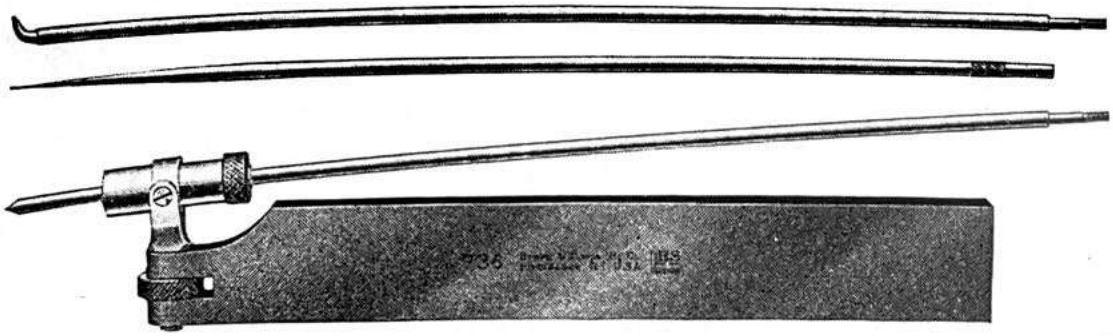


Note how simply and securely dial gage can be clamped in place.

Each of the above packed one in a box.

Lathe Test Indicator No. 736

Price, $5.25



736

738

This Indicator is to be held in the tool post of a lathe and is for testing pieces held in a chuck or between centers, and inside or outside of pulleys, etc. The case hardened steel bar is 6″ long, 7/8″ wide, and 3/8″ thick.

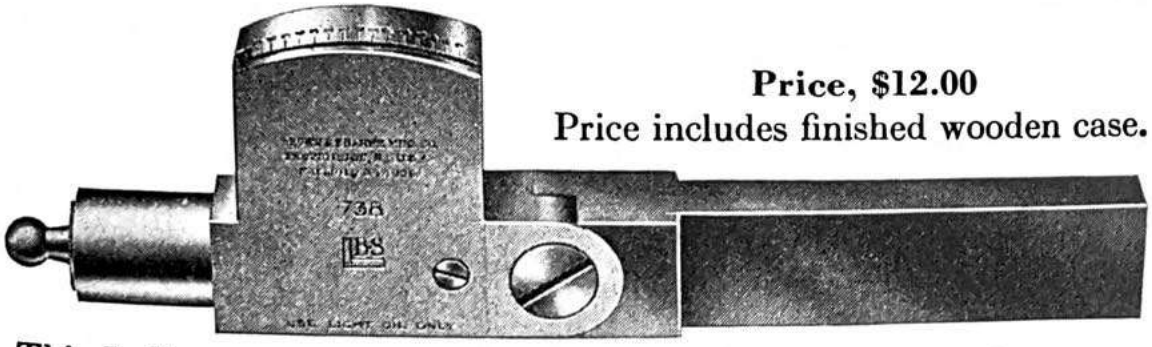
A spiral spring holds the finger against the work with an even pressure, and finger can be adjusted to length required. Two fingers are furnished, one ground to an angle of 60° and the other bent for inside and outside testing. The yoke can be swiveled, and locked in position by the clamp nut.

Indicator No. 738

ENGLISH MEASURE
Range, 0 to .007″
Either side of zero
by thousandths of an inch

or

METRIC MEASURE
Range, 0 to 0.18 mm
Either side of zero
by hundredths of a millimeter



Price, $12.00
Price includes finished wooden case.

This Indicator is for centering work in a lathe, testing lathe centers, shafting, and work of a similar nature. The shank is made of hardened steel. It can be held in the tool post of a lathe and adjusted either upwards or downwards. The indicator point is of hardened steel, spherical in shape, allowing pressure to be brought upon it from any angle in taking readings.

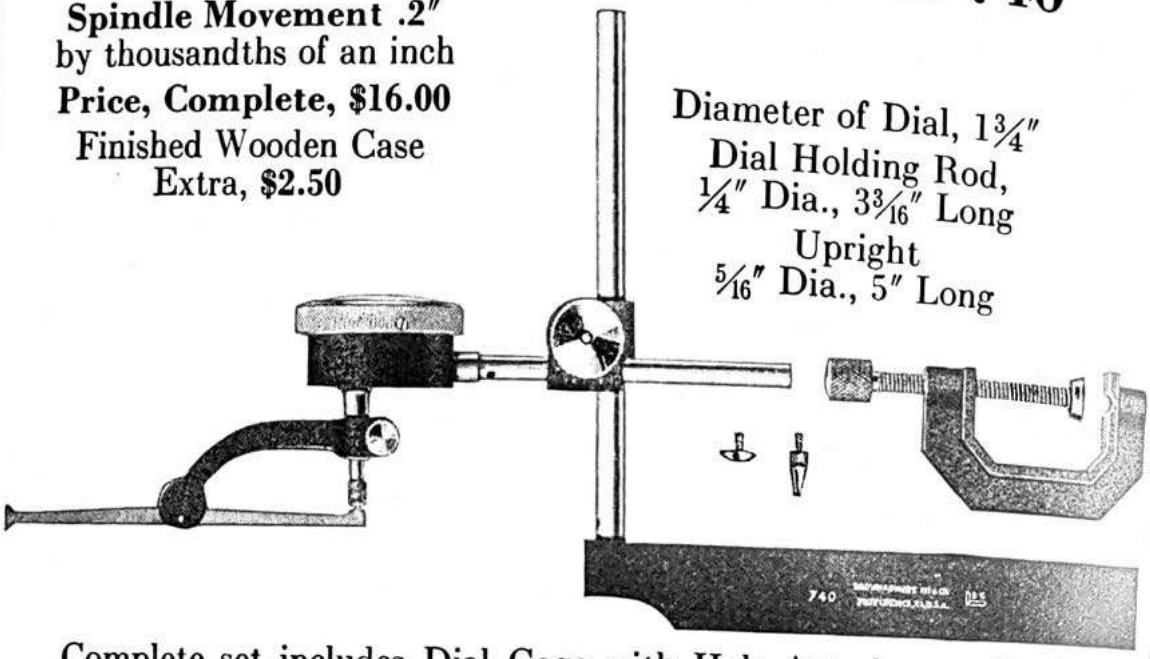
Each of the above packed one in a box.

Universal Dial Indicator Set No. 740

Spindle Movement .2″
by thousandths of an inch
Price, Complete, $16.00
Finished Wooden Case
Extra, **$2.50**

740

Diameter of Dial, 1¾″
Dial Holding Rod,
¼″ Dia., 3¹⁄₁₆″ Long
Upright
⁵⁄₁₆″ Dia., 5″ Long



Complete set includes Dial Gage with Hole Attachment, Bar with upright Rod, Clamp, Sliding Swivel, Dial Holding Rod and three chromium plated contact points.

Can be adjusted to almost any position and used in places inaccessible to ordinary indicators. Hole attachment will enter approximately 1½″ in hole as small as ¼″ diameter. Clamp has brass swivel to prevent marring work. Bar is case hardened steel 6″ long, ⅜″ thick and ⅞″ wide. Swivel, also, fits Surface Gages No. 621, a particularly convenient combination, (see opposite page).

Dial Gage is extremely durable and has simple adjustment for wear. Measures by thousandths of an inch. By bringing contact point against work with enough pressure to give hand complete revolution, readings may be taken 1-10″ either side of zero. Knurled rim turns to bring zero under hand.

Packed one in a box.

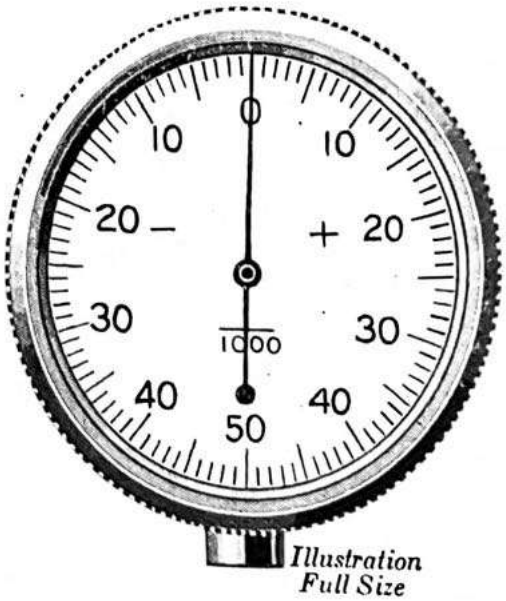
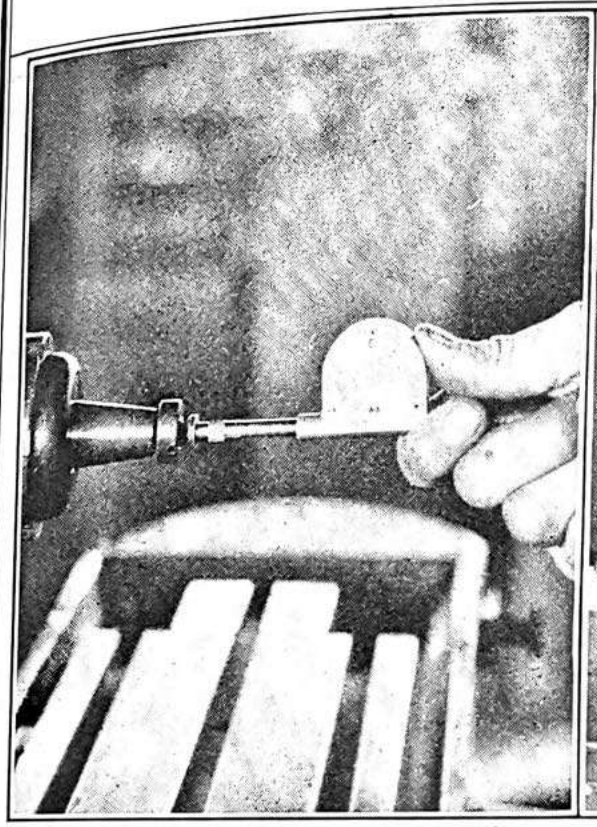


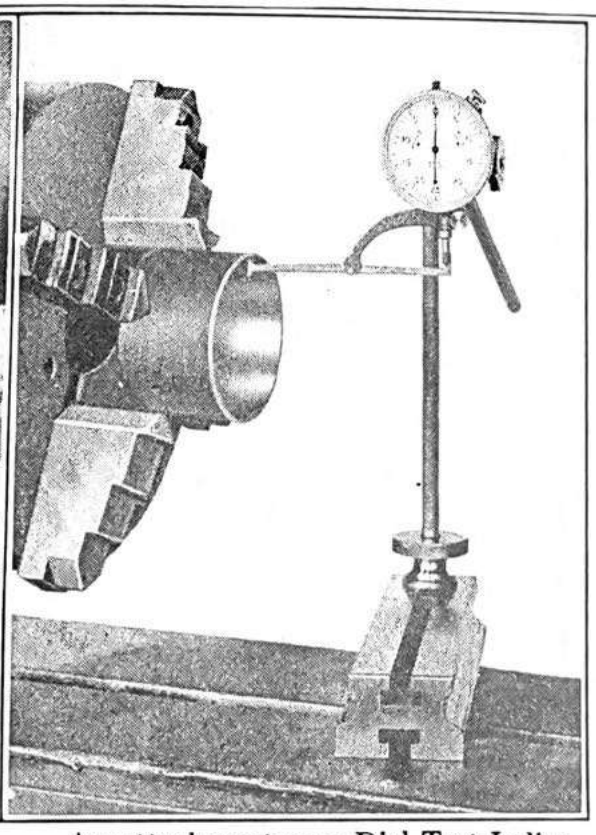
Illustration Full Size

Separate Parts

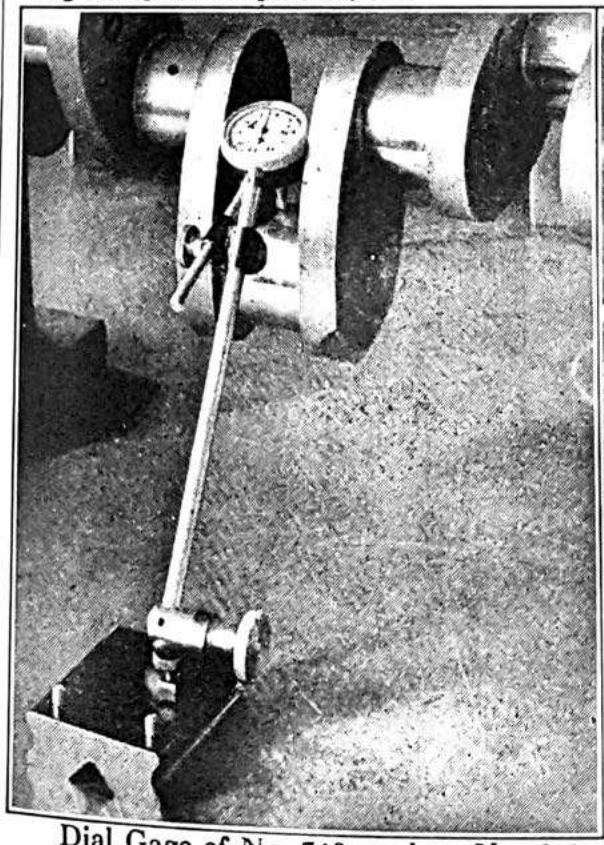
	Price
Dial Gage Only, with 3 Contact Points	$12.00
Hole Attachment	1.75
Clamp	.90
Bar with Upright	.90
Dial Holding Rod	.50
Sliding Swivel	.90
Contact Points, each	.20



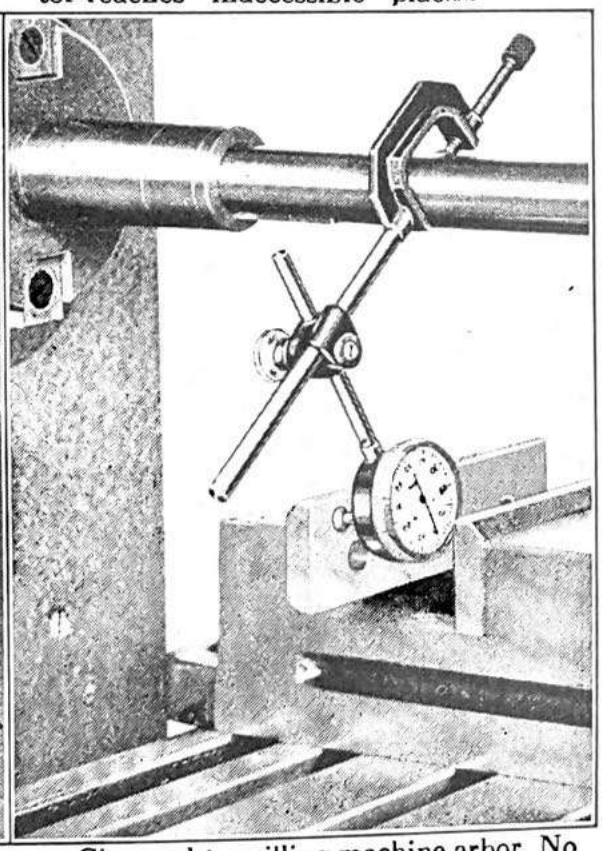
A Speed Indicator is essential for showing the speed of spindles, etc.



An attachment on a Dial Test Indicator reaches "inaccessible" places.



Dial Gage of No. 740 used on No. 621 Surface Gage to test bearings within throws of crankshaft.

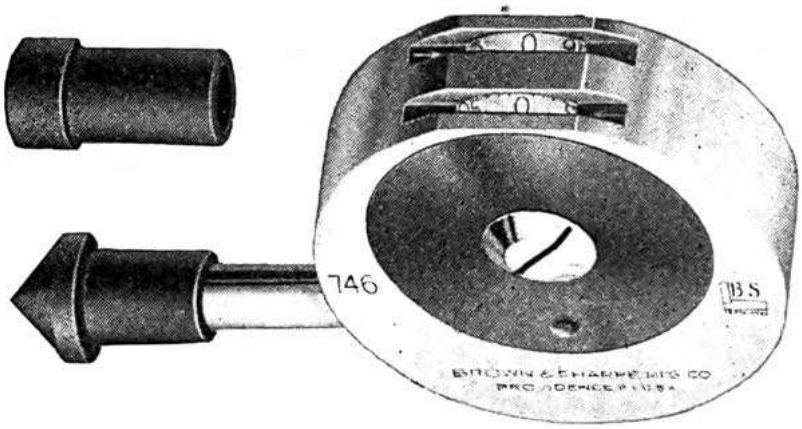


Clamped to milling machine arbor, No. 740 aids in adjusting vise on table.

Vest Pocket Speed Indicator No. 746

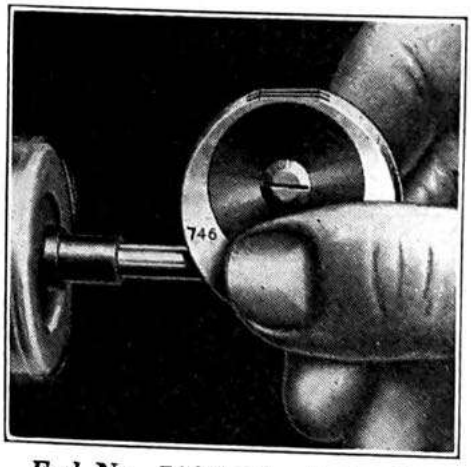
Price, $1.50

746 Price includes two points as shown



This speed indicator is useful for checking the speeds of shafting, wheels, etc. It is easy to use and fits conveniently in a vest pocket.

After the tool has been set at zero, place thumb directly on the small depression in its side and apply the rubber point to the center of the wheel or shaft whose revolutions are to be determined. Every hundred revolutions, the steel plate lifts beneath your thumb, as if breathing. Count for one minute the number of lifts, each of which represents 100 revolutions. The R. P. M. in either direction are obtained by adding to the number of 100 revolutions the reading in units of 5 which appears in the slot at the top of the tool. If the R. P. M. are less than 100, the reading in the opening will give the R. P. M. direct.



Feel No. 746 beat off the hundreds. Notice how simple this tool is to use and how easily R. P. M. can be determined with it.

Extra Points, Price, 15 cents each

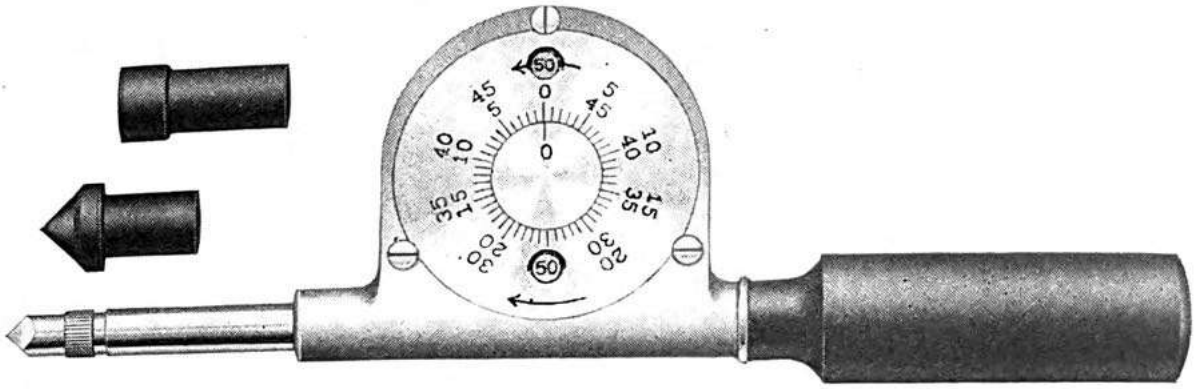
Packed one in a box.

Speed Indicator No. 748

Price, $6.75 Case, **$1.50**

Patented

748



This Speed Indicator accurately determines the revolutions of shafting, etc., in either direction and measures both high and low speeds equally well. It has few parts, is simple in operation, and reliable.

The indicator registers up to 5,000 revolutions. Speeds faster than 5,000 R.P.M. can very readily be determined. All readings are taken from one side of the indicator and the two arrows on the face of the dial indicate the figures pertaining to the different directions of rotation, eliminating any confusion. It is merely necessary to place the point of the indicator on the spindle or shaft and watch the dial for a given time. The figures showing through the small round windows on the dial read every 5 revolutions. The inside dial reading every 100 revolutions is quickly returned to zero for repeated use by a knurled knob on the back of the indicator.

The fibre handle is conveniently shaped and is an insulation against electricity. All the working parts are enclosed in a heavily dull-nickeled case. Two rubber points are furnished as shown. The steel point is for ordinary speeds and the rubber points are for high speeds.

This Speed Indicator is very neat, light, and convenient to handle, with no rough edges or projections to interfere with its use.

Packed one in a box.

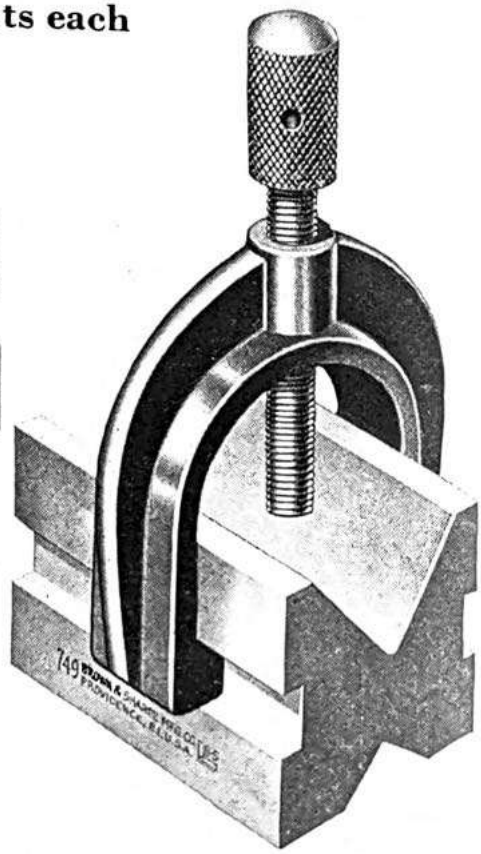
V Blocks and Clamp No. 749

Price, $1.85

Price Includes Two Blocks and One Clamp

Extra Clamps, Price, 60 cents each

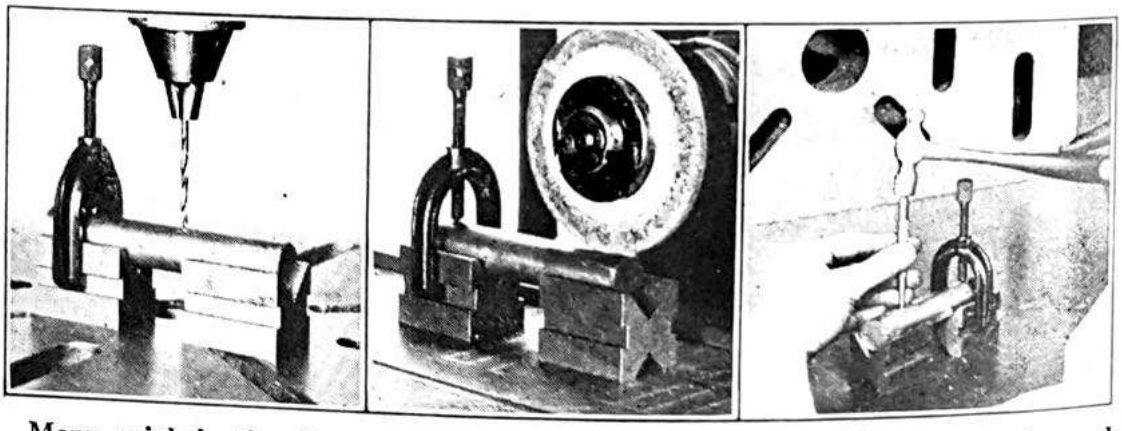
749



For holding circular pieces to be drilled, milled or ground. Hold work firmly and prevent turning or slipping.

Made of cast iron and intended for general machinists' use. Each block is 2″ long by 1½″ square and takes work to 1½″ diameter. Clamp is ribbed and very rugged. Knurled head of screw has hole for pin or rod, for tightening work. Blocks are not sold singly.

Packed two blocks and one clamp in a box.

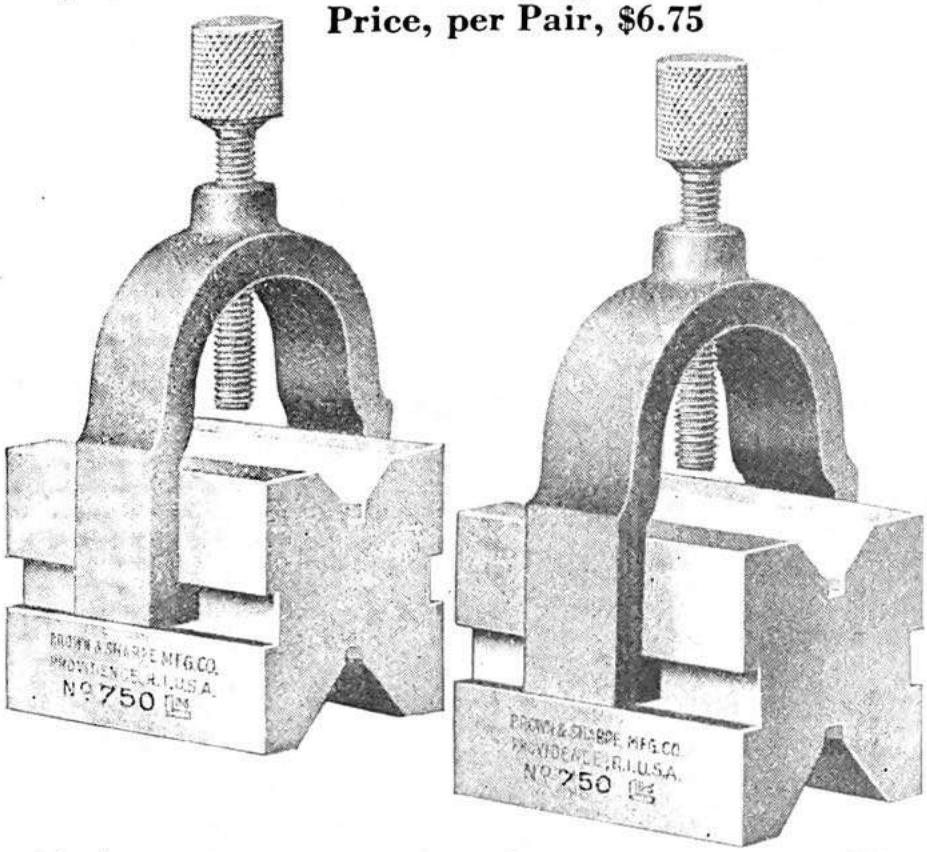


Many a job in the shop gets done quickly and easily with these V Blocks and clamp.

V Blocks and Clamps No. 750A

Price, per Pair, $6.75

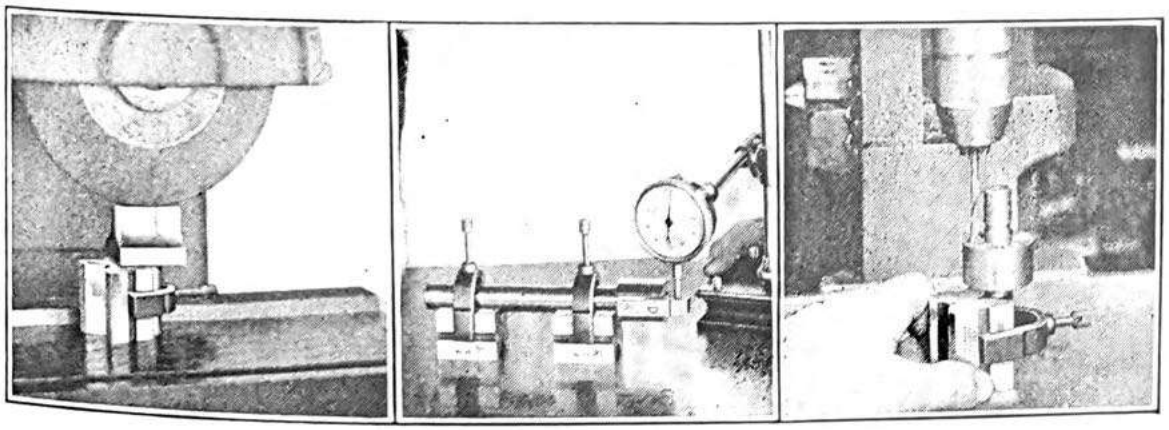
750 A



These blocks are hardened tool steel and very accurate. The sides are ground parallel and the V grooves carefully ground central and parallel to the bottom and sides. Finish ground on all four sides. They are made and sold in numbered pairs, so that the V grooves in blocks of the same numbers are always in alignment. (We cannot agree to furnish a mating block at a later date.) Especially useful for accurately laying out work in connection with a surface plate, angle iron or knee.

Each block is approximately 1¼″ x 1¼″ x 1⅝″ and will take work to 1″ in diameter.

Packed one pair of blocks and two clamps in a box.



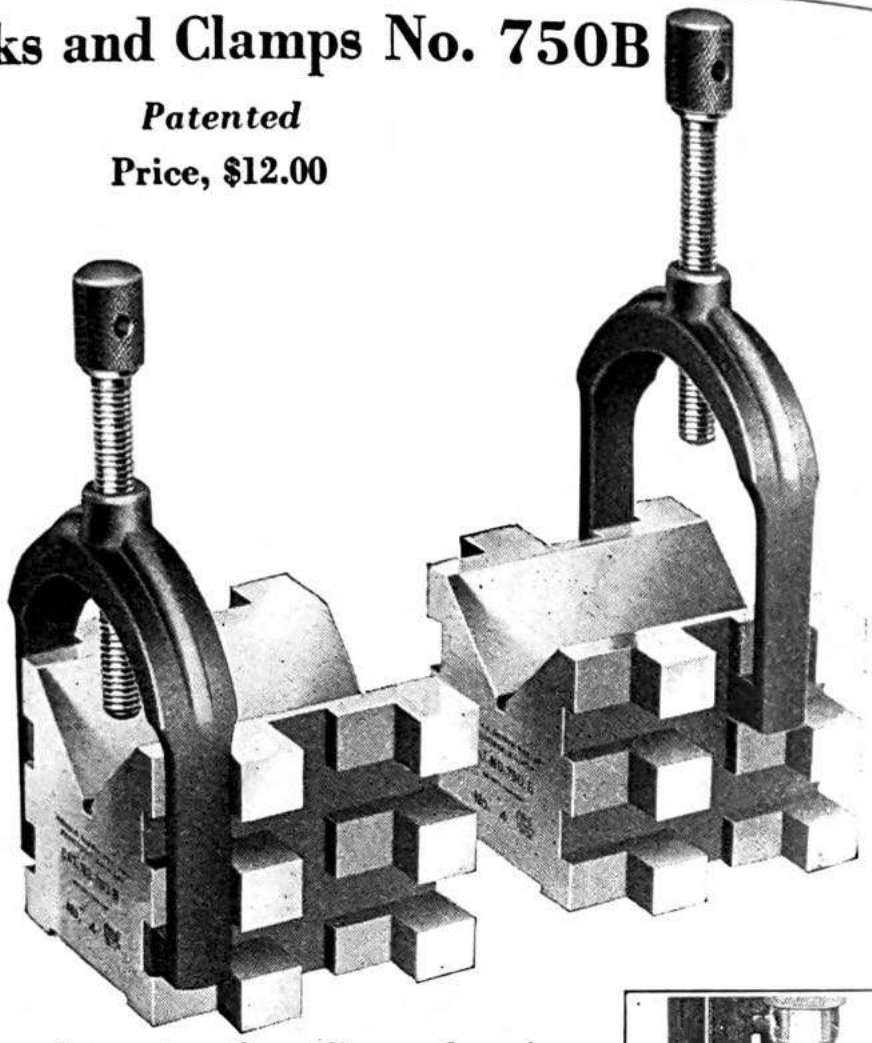
These V Blocks are suited for the finest tool room work.

V Blocks and Clamps No. 750B

Patented

Price, $12.00

750 B

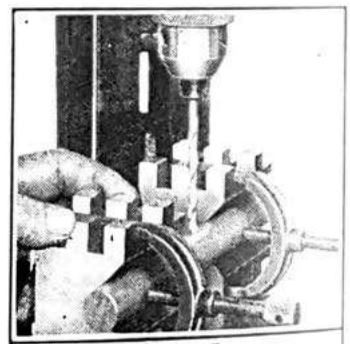


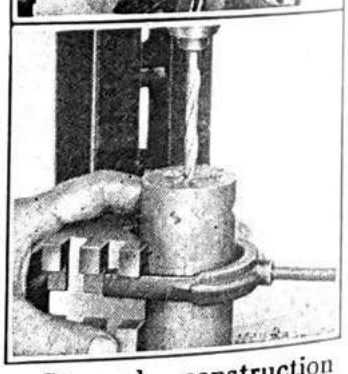
The stepped construction allows changing clamps quickly from small work to work 2″ in diameter. The blocks can be used on their sides as the clamps do not project.

Blocks are hardened steel and sides are ground parallel. V grooves are ground central and parallel to the bottom and sides. Made and sold in numbered pairs, so that the V grooves in blocks of the same numbers are always in alignment. All sides are at right angles. Each block is approximately 2½″ long by 2¾″ wide by 2″ high, and will take work to 2″ diameter. Clamps are drop forged and clamp screws are hardened.

Packed one pair of blocks and two clamps in a box.

Blocks can be furnished separately but we cannot agree to furnish a mating block at a later date. **Price, $6.75 each,** for single block and clamp.

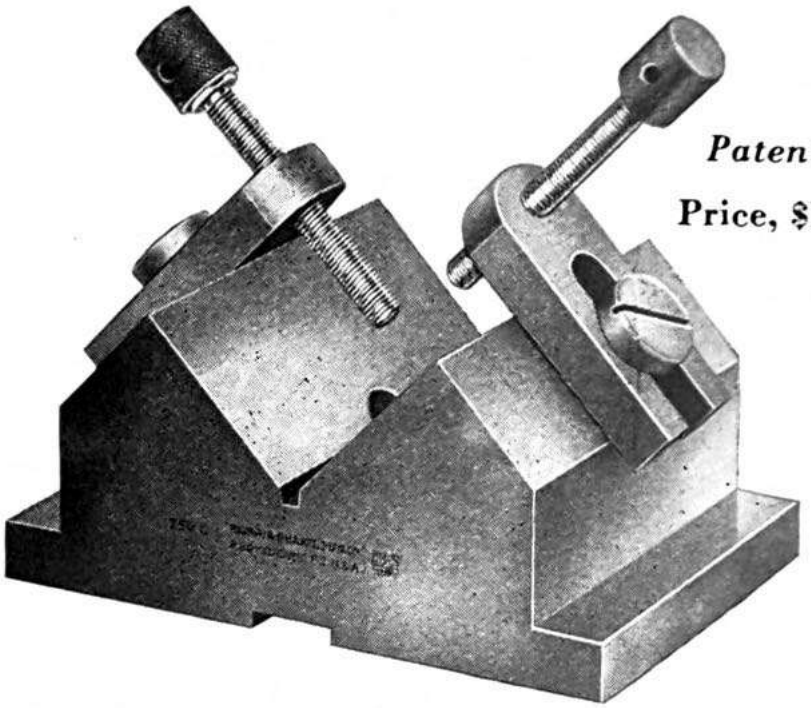




Stepped construction gives these blocks many advantages. Suitable for most accurate work.

V Block No. 750C

750 C



Patented

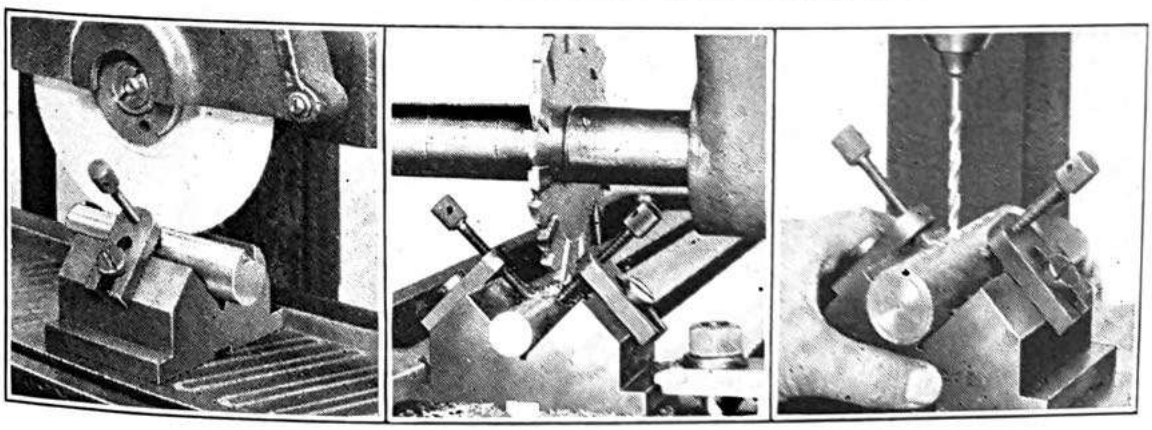
Price, $12.00

This block leaves entire top side of the work accessible.

The two clamps hold stock of square or rectangular cross section, as well as round stock. A ½″ hole through the center of the block allows drills, drifts, etc. to project through the work. Has groove in the bottom ⅝″ wide and ⅛″ deep for use on a machine table where it is clamped conveniently by the flanges.

Block is hardened steel 3″ long, 4¾″ wide, 2″ high, ground on bottom. Has a capacity for round stock to 1½″ diameter. Clamps and screws are hardened.

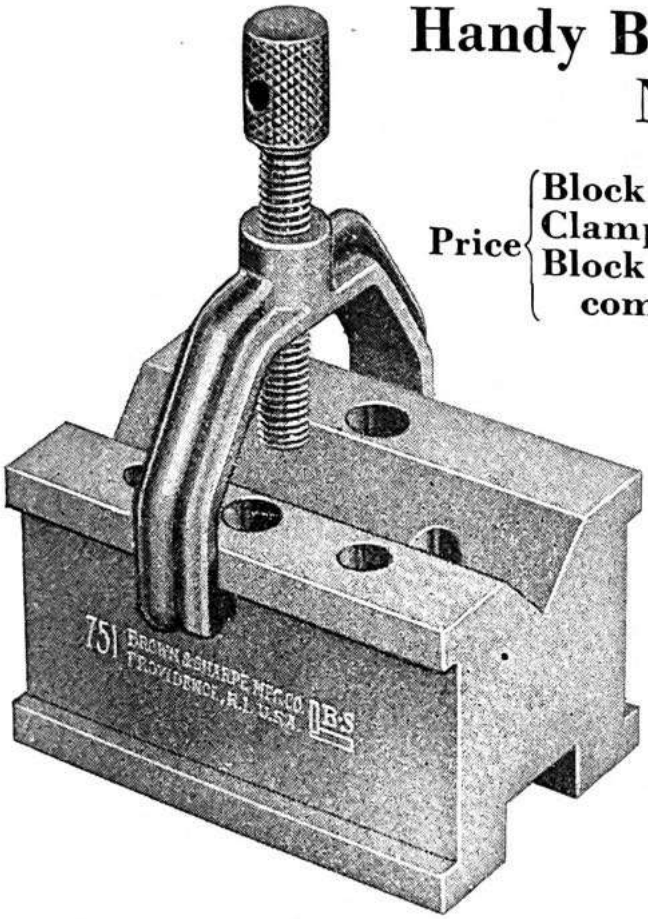
Packed one block and two clamps in a box.



Top side of work is unobstructed when held with this clamp.

751

Handy Block and Clamp No. 751



Price

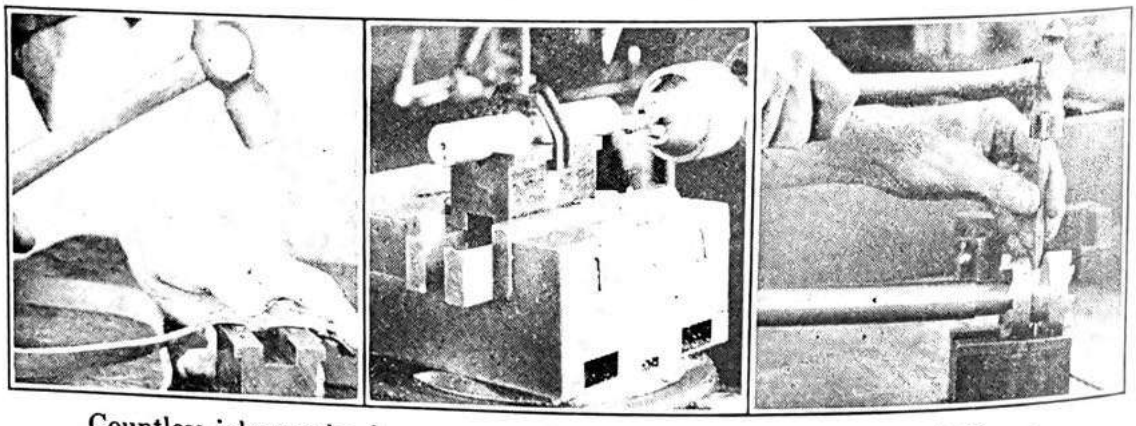
Block only	$2.25
Clamp—with screw	.60
Block and Clamp, complete	2.75

Sent complete unless otherwise ordered.

This sturdy tool is very handy for holding small circular or flat pieces for milling, grinding or drilling. It is designed for general usefulness in the home, garage or shop, as a vise, anvil, V block or centering clamp.

The steel block is 3″ long, 1¾″ high and 2″ wide and is accurately machined and carefully case hardened. Clamp will hold round stock up to 1″ diameter and flat stock up to ¾″ by 1¼″.

Packed one block and one clamp in a box.

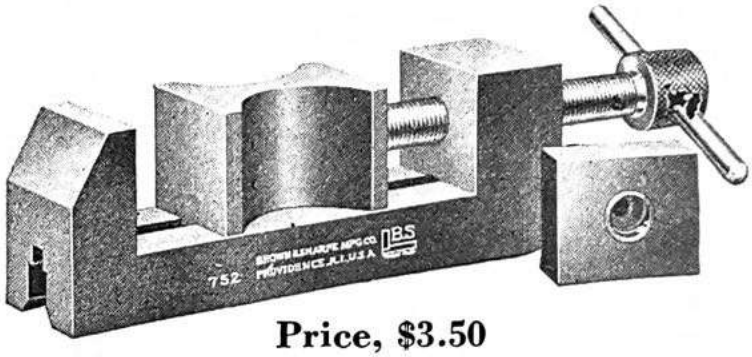


Countless jobs can be done more easily with this Handy Block and Clamp.

Toolmakers' Vise No. 752

752

753



Price, $3.50

This vise is a reliable and handy tool for use in drilling, fitting and laying out work on surface plates. It is case hardened and the base is ground. The V groove in the under side of the base takes work from 9/32″ to 11/16″ diameter and thus adds to the handiness of the vise as it can be used as a V block.

The large jaw is provided with a tongue which slides in a groove in the base and is held in place by a strap. This feature enables the vise to hold the work firmly and prevents the jaw from lifting. The strap can be removed and by using the jaw upside down, taper pieces can be held in the tool. The greatest capacity of the vise is 2″. Each vise is furnished, as shown in the cut, with two steel jaws that slip on and off the screw.

Toolmakers' Vise Clamp No. 753

Price, $1.50

This vise clamp is not provided with the V groove in the base or with the tongue on the larger jaw and its corresponding slot. Vise clamps are generally used in pairs for holding work to be drilled, etc. The base is case hardened. Greatest capacity of this tool is 1¾″.

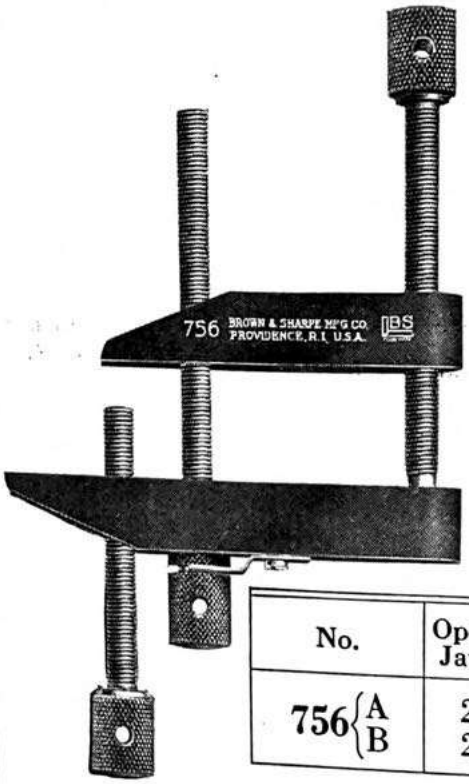
Each of the above packed one in a box.

Toolmakers' Clamps No. 754

754
756

Designed to insure greatest strength and rigidity. Made of steel, case hardened. Ends of jaws are rounded to facilitate clamping under shoulder or in recess. Clip holds "loose" jaw in position when clamping screw is released, a very convenient and an original Brown & Sharpe feature.

No.		Opening of Jaws, Inches	Length of Jaws, Inches	Price, Each
754	A	5-8	1 1-2	$0.70
	B	1	2 1-8	.85
	C	1 1-2	2 3-4	1.00
	D	2	3 3-8	1.20
	E	2 1-2	4	1.50
	F	3 1-2	5	2.30



Toolmakers' Clamps No. 756

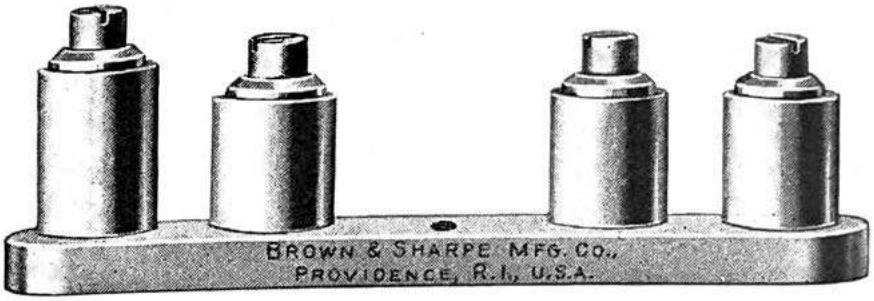
Patented

Long jaw helps hold pieces that ordinary clamp cannot grip. Auxiliary screw gives support, and prevents pieces from slipping. Clip on adjusting screw holds "loose" jaw in position. By changing screws in jaws, tool can also be used as regular clamp. Jaws are rounded on ends to facilitate clamping under shoulder or in recess. Made of steel, case hardened.

No.		Opening of Jaws, In.	Length of Long Jaw, In.	Length of Short Jaw, In.	Price, Each
756	A	2	3 3-8	2 5-8	$2.25
	B	2 1-2	4	3	2.50

Each of the above packed one in a box.

Toolmakers' Buttons No. 758



758

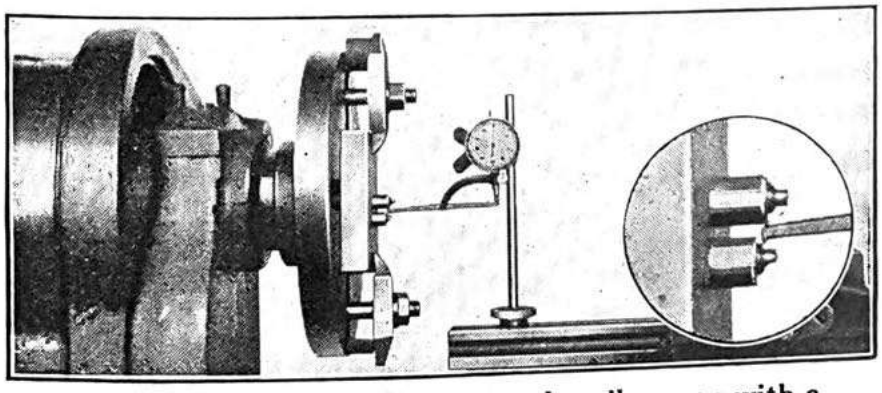
The positive accuracy with which holes may be located by means of these buttons recommends them for precision work. They are carefully made and their ends are ground square with the sides. An exclusive Brown & Sharpe feature is an extra long button in each set, permitting them to be used unusually close together.

Brown & Sharpe Toolmakers' Buttons Nos. 758A, 758B and 758C are made in sets, of four, of the same diameter, .300, .400, and .500 inch, respectively. In each set, three are seven sixteenths of an inch long, and one is nine sixteenths of an inch. The buttons are fastened to a steel base which is thick enough to protect the ends of the screws that hold them.

No.	Diameter, Inches	Price, per set
758 A	.300	**$3.50**
758 B	.400	**3.50**
758 C	.500	**3.50**

Tap No. 5—40 Am. Nat'l. Coarse or ⅛″ 40 U. S. F. for use with buttons, **price, each, 35 cents.**

Packed one set in a box. Three boxes in a carton.

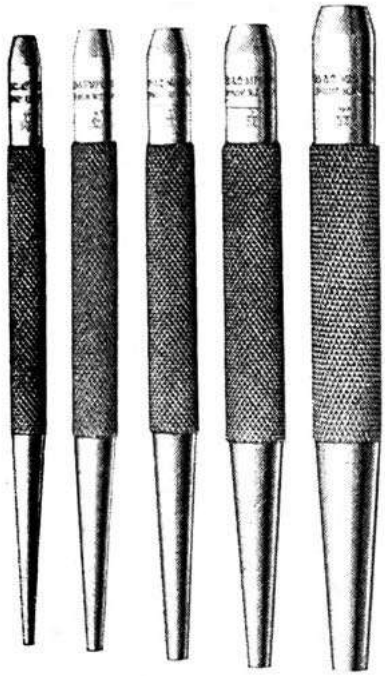


The Long Button may be centered easily, even with a Short Button close beside it.

Nail Sets No. 762

762

765



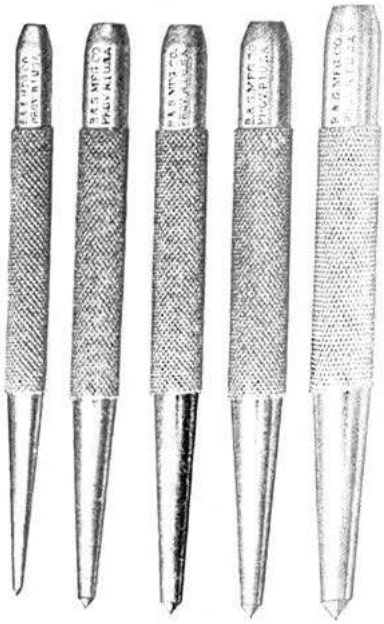
Of tool steel, carefully hardened. They are of convenient sizes, about 4″ in length and are knurled to provide a good finger grip. The points are concave and the edges rounded.

No.		Diameter at Point, Inches	Price
762	A	1-16	$0.25
	B	3-32	.25
	C	1-8	.25
	D	5-32	.25
	E	7-32	.30

Price per dozen, **$2.75**

Machinists' Center Punches No. 765

These punches are of convenient sizes and knurled on the body to afford a good finger grip. Both ends are tempered, and the points carefully ground to an angle. They are about 4″ in length.



No.		Diameter at Top of Tapered Point, Inches	Price
765	A	1-16	**$0.25**
	B	3-32	**.25**
	C	1-8	**.25**
	D	5-32	**.25**
	E	7-32	**.25**

Set of five sizes in case, **Price, $1.50**

Each of the above packed six in a box.

Automatic Center Punches No. 770

No. 770

Style 1,	**4 1-8″ long,**	**3-8″ diameter.**	**Price, $2.00**
Style 2,	**5 1-4″ long,**	**9-16″ diameter.**	**Price, $3.00**
Style 3,	**6″ long,**	**3-4″ diameter.**	**Price, $4.00**

The striking mechanism of this Automatic Center Punch is enclosed in the knurled handle, which is of such a size and form as to be held conveniently in the hand. A downward pressure releases the striking block and makes the impression. The punch marks are of uniform depth. **770**

The points on Styles 2 and 3 can be taken out for grinding and are easily replaced if broken. **771**

Style 1 is adapted for carrying in the pocket, and is a small, light tool suitable for the more delicate work required in tool making.

Style 3 differs from the Style 2 in being slightly heavier in construction and capable of striking a much heavier blow.

Extra Points for Style 1 Punch, **Price, 60 cents each.**

Extra Points for either Style 2 or 3 Punch, **Price, 20 cents each.**

Automatic Center Punch No. 771

Adjustable

5 3-4″ long, 9-16″ diameter. Price, $3.50

The length of stroke of this Automatic Center Punch is adjustable. This feature is one that is readily appreciated by mechanics, as it adapts the tool to all varieties of tool and general shop work.

The adjustment of the stroke is made by the knurled cap on the top of the handle. To adjust for fine work requiring a light mark, turn the cap to the right; for coarse work, turn the cap to the left.

The points can be taken out for grinding and are easily replaced if broken.

Extra Points, Price, 20 cents each.

Each of the above packed one in a box.

No. 771

Spacing Attachment No. 775

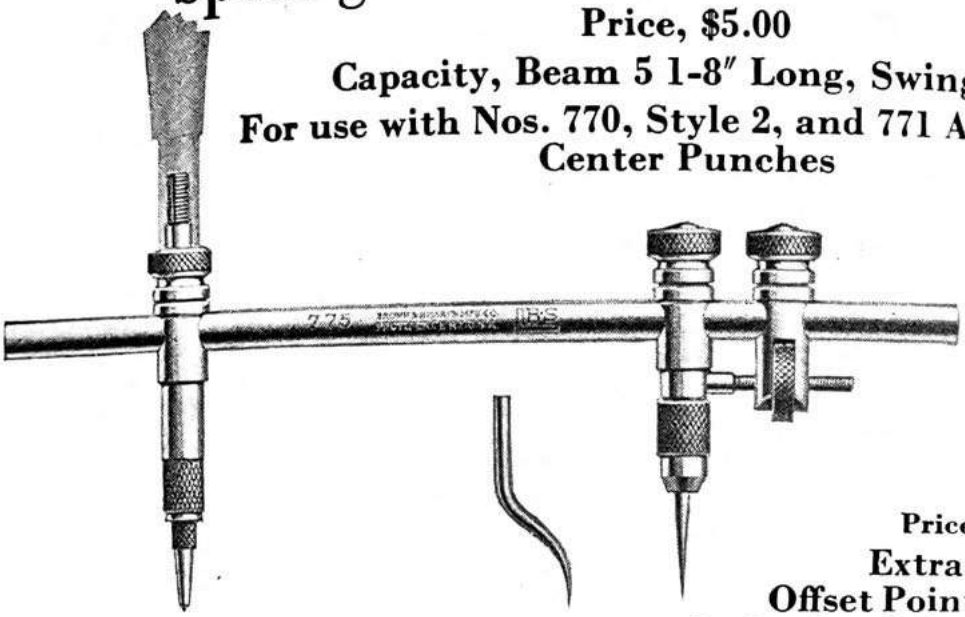
Price, $5.00

Capacity, Beam 5 1-8″ Long, Swings 8″

For use with Nos. 770, Style 2, and 771 Automatic Center Punches

775

778



Price, Each

Extra Points

Offset Point 30 cents

Straight Scriber Point 20 cents

Useful in spacing or laying out work to be machined or drilled. The attachment screws on to the center punch, in place of the removable point.

Fine adjustment is obtained by the adjusting screw and slide. The point is held by a spring chuck and can be adjusted to varying lengths.

14″ Extension for No. 845 Steel Beam Trammel, page 442. can be used with this Attachment for large work. See, also, Points for Universal Divider and 14″ Steel Beam Trammel on page 443.

Packed one in a box.

Scribers No. 778

Style 1, Single Point, Pocket **Price, 50 cents**

Style 2, Single Point, 5″ long **Price, 35 cents**

Style 3, Double Point, 8″ long **Price, 45 cents**

The point of Style 1 is held firmly by a two-jawed chuck. It may be reversed and the scriber closed to about 4″ in length. This scriber is very light and convenient to handle—weighing approximately ¼ ounce.

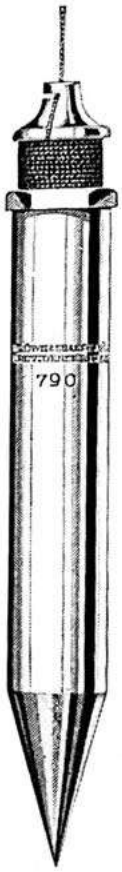
The points of Scribers Nos. 2 and 3 screw into the holders and are knurled for finger grip.

Extra points for any of above scribers, **Price, 15 cents each.**

Each of the above scribers packed six in a box.

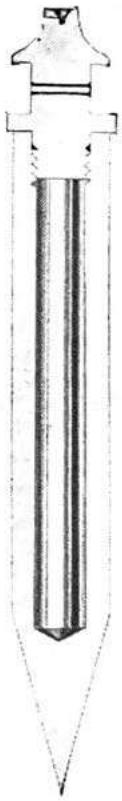
Mercury Plumb Bobs No. 790

These Plumb Bobs are made from a solid steel rod, bored out and filled with mercury, which makes them unusually heavy in proportion to their size. The center of gravity is low. The cut at the right shows the manner in which these plumb bobs are constructed. The comparatively small diameters allow them to be used close to corners and walls. They are not easily affected by drafts of air and may be conveniently carried or packed in small spaces. The hexagonal nut prevents plumb bob from rolling when it is laid on its side. 790



An important feature is the device for fastening the string without a knot. After unwinding the required length, the cord is inserted in a slot in the cap which centralizes the cord and makes the bob hang true.

The points are hardened, and the bodies and points are ground. The plumb bobs are nickel plated and each is furnished with a braided silk line. The 3½ oz. size can be easily carried in the vest pocket.



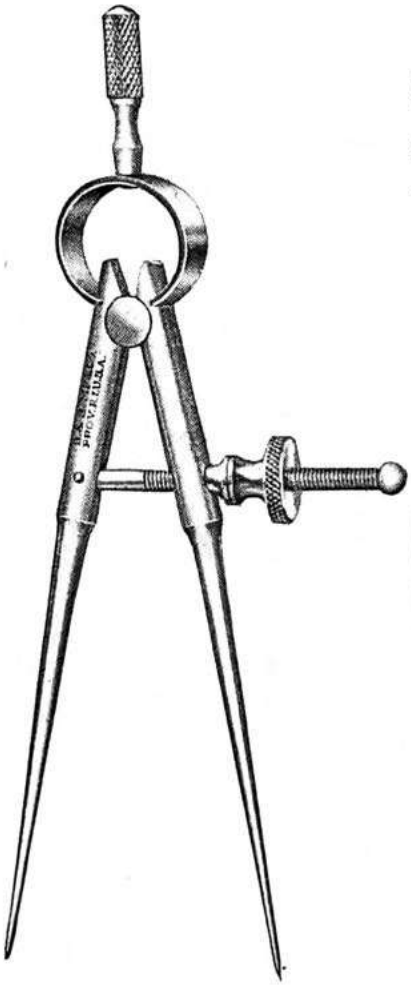
Weight, Ounces	Length, Inches	Diameter, Inches	Price
3 1-2	4	1-2	$1.80
6	4 1-2	5-8	2.40
12	5 3-8	7-8	3.00
16	6	1	3.60

Packed one in a box.

Toolmakers' Spring Dividers and Spring Calipers

800

THESE are finely finished, well balanced tools. The spring is unusually stiff and of a construction that insures rigidity, preventing side deflection of the legs and giving uniform pressure. The legs are of steel, round and highly polished; the measuring points come together evenly.



Especial attention is called to the 2″ sizes, as they are convenient for small, light work and for carrying in the pocket.

Toolmakers' Spring Dividers No. 800

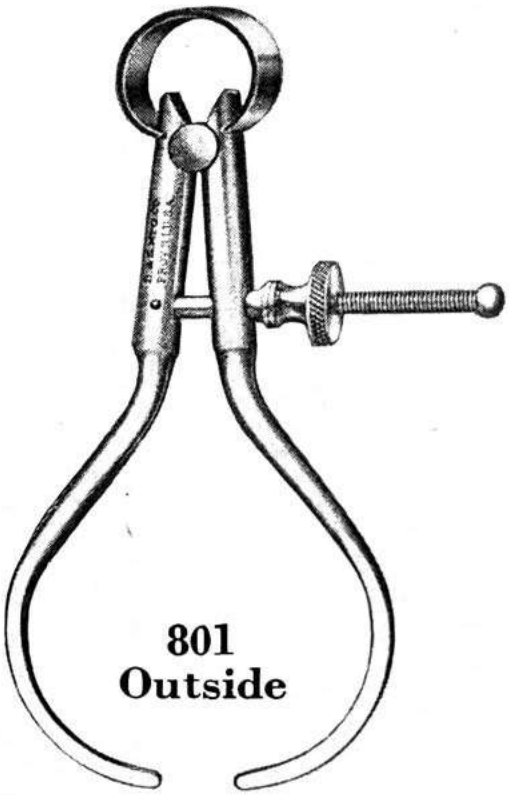
No.	Size, Inches	Price
800	2	$1.20
	3	1.50
	4	1.80
	5	1.80
	6	2.10

Packed two in a box.

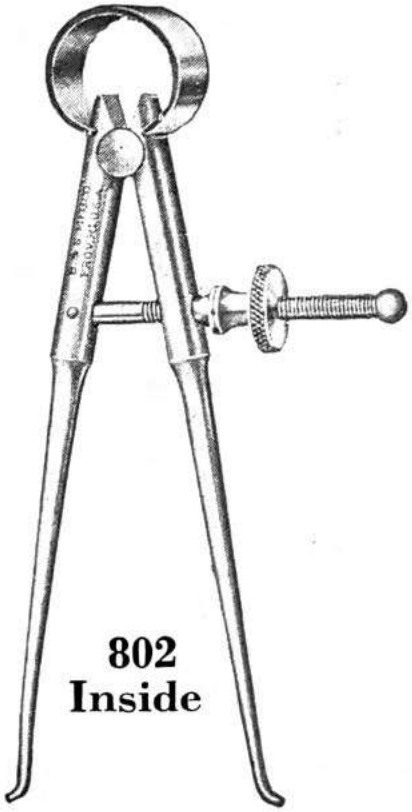
Toolmakers' Outside and Inside Spring Calipers Nos. 801 and 802

801

802



801
Outside



802
Inside

No.	Size, Inches	Price	No.	Size, Inches	Price
801	2	$1.20	802	2	$1.20
	3	1.50		3	1.50
	4	1.80		4	1.80
	5	1.80		5	1.80
	6	2.10		6	2.10

Each of the above packed two in a box.

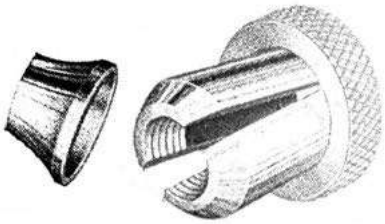
Duplicate Parts for Toolmakers' Spring Dividers and Spring Calipers

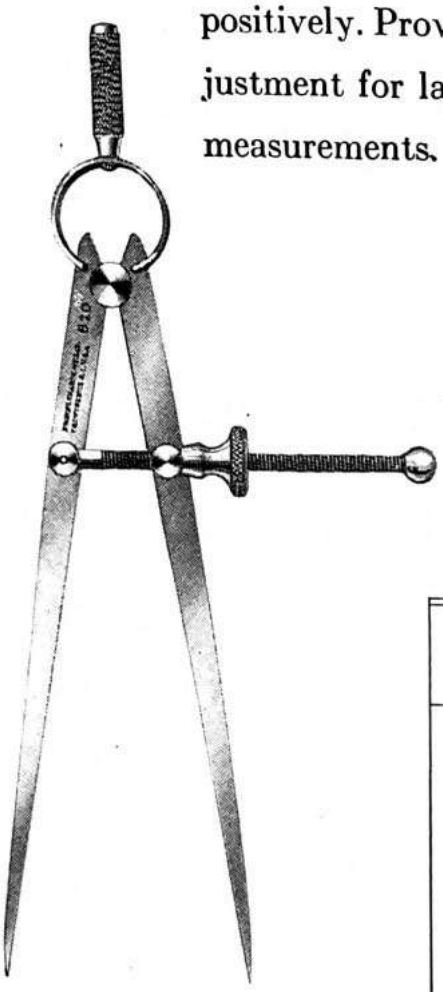
Leg	$0.40
Screw and Ball	.20
Nut	.15
Spring	.30
Spring with Thumb Attachment for Dividers	.50
Thumb Attachment	.20
Nut Washer	.15
Fulcrum Stud	.15

Spring Dividers No. 810 and Spring Calipers Nos. 811 and 812

810 Attractive and durable. Especially developed for those who require reliable tools of less expensive construction and finish than the Toolmakers' Calipers and Dividers.

The Spring Nut releases easily and grips the screw positively. Provides quick adjustment for large and small measurements.





Spring Dividers No. 810

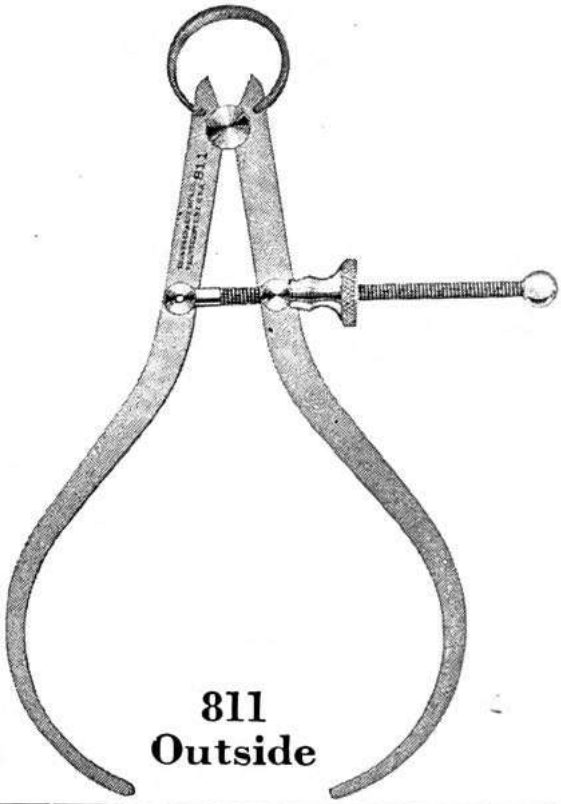
No.	Size, Inches	Price with Spring Nut	Price with Solid Nut
810	2 1-2	$1.00	$0.80
	3	1.05	.85
	4	1.10	.90
	5	1.15	1.00
	6	1.20	1.05
	8	1.50	1.35

Packed two in a box.

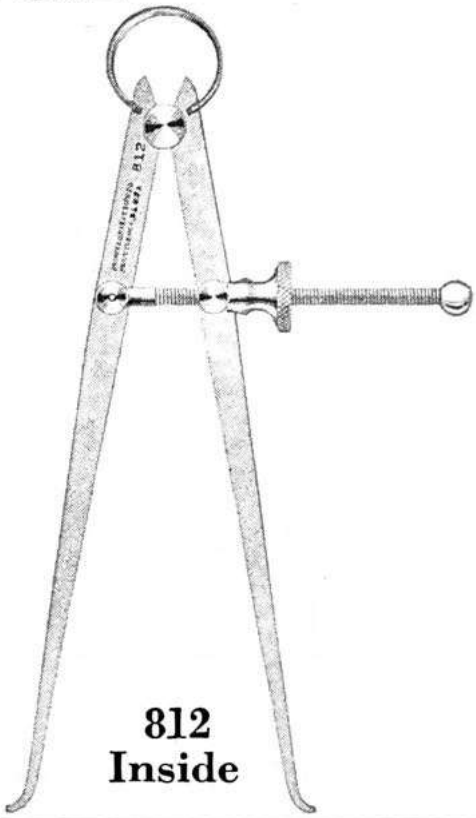
Outside and Inside Spring Calipers Nos. 811 and 812

811

812



811
Outside



812
Inside

No.	Size, Inches	Price with Spring Nut	Price with Solid Nut	No.	Size, Inches	Price with Spring Nut	Price with Solid Nut
811	2 1-2	$1.00	$0.80	812	2 1-2	$1.00	$0.80
	3	1.05	.85		3	1.05	.85
	4	1.10	.90		4	1.10	.90
	5	1.15	1.00		5	1.15	1.00
	6	1.20	1.05		6	1.20	1.05
	8	1.40	1.20		8	1.40	1.20

Each of the above packed two in a box.

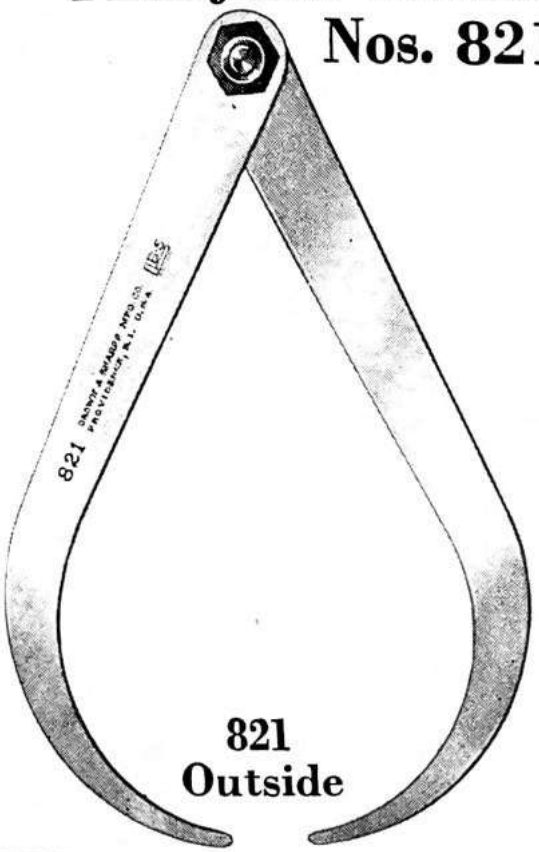
Duplicate Parts for Spring Dividers No. 810 and Spring Calipers Nos. 811 and 812

Leg	$0.30
Screw and Ball	.20
Solid Nut	.15
Spring	.30
Spring with Thumb Attachment for Dividers	.50
Spring Nut	.30
Nut Washer	.15
Thumb Attachment	.20
Fulcrum Stud	.15

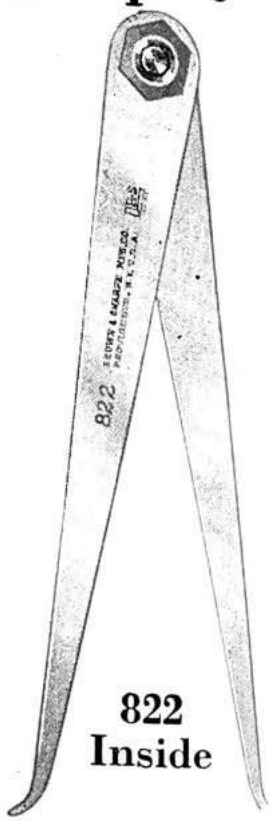
Firm-Joint Outside and Inside Calipers Nos. 821 and 822

821

822



821 Outside



822 Inside

No.	Size, Inches	Price	No.	Size, Inches	Price
821	3	$0.50	822	3	$0.50
	4	.60		4	.60
	5	.70		5	.70
	6	.80		6	.80
	8	1.00		8	1.00
	10	1.10		10	1.10
	12	1.20		12	1.20
	14	1.80		14	1.80
	16	2.10		16	2.10
	18	2.55		18	2.55
	20	3.00		20	3.00
	24	3.60		24	3.60

Sizes above refer to length of leg. Actual capacities are as follows:

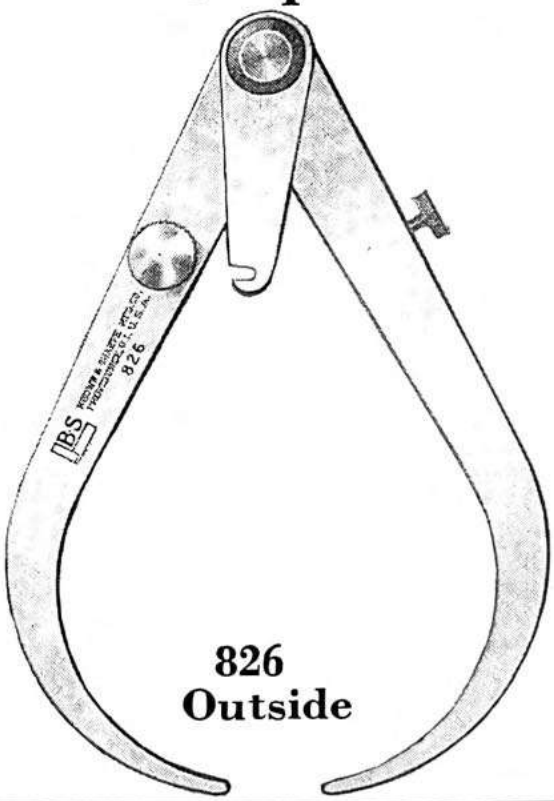
Size.....	3	4	5	6	8	10	12	14	16	18	20	24
Actual Capacity of Outside Calipers..... Inches	3 1-2	4 1-2	6	7	9 1-2	12	15	17	19	22	24 1-2	29 1-2

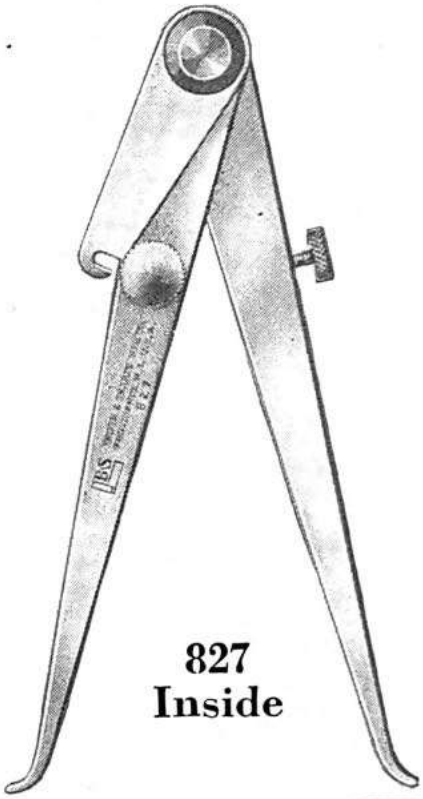
Each of the above packed as follows: 3″, 4″, 5″, and 6″, six; 8″, 10″ and 12″, four; 14″ and 16″, two; 18″, 20″ and 24″, one in a box.

Transfer Firm-Joint Outside and Inside Calipers Nos. 826 and 827

826

827





No.	Size, Inches	Price	No.	Size, Inches	Price
826	4	$1.30	827	4	$1.30
	5	1.50		5	1.50
	6	1.60		6	1.60
	8	1.90		8	1.90
	10	2.20		10	2.20
	12	2.50		12	2.50
	14	2.80		14	2.80
	16	3.10		16	3.10
	18	3.40		18	3.40
	20	4.00		20	4.00
	24	4.90		24	4.90

Sizes above refer to length of leg. Actual capacities are as follows:

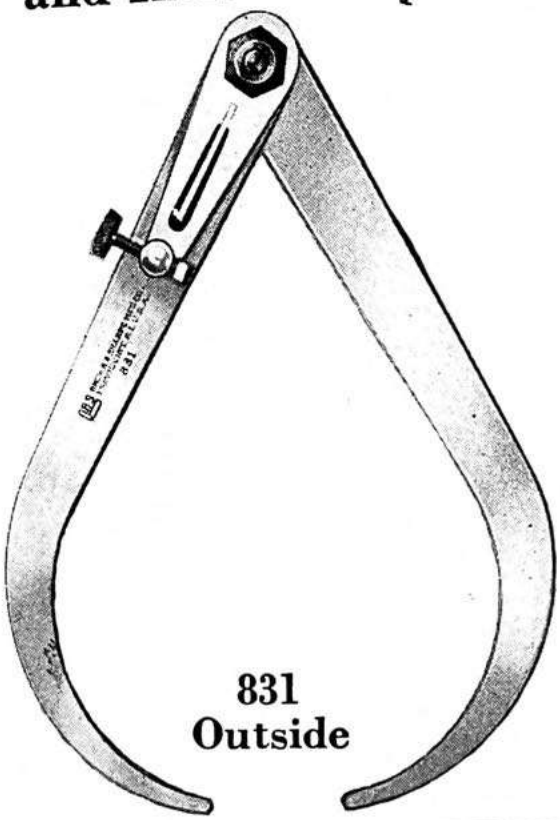
Size	Inches	4	5	6	8	10	12	14	16	18	20	24
Actual Capacity of Outside Calipers	Inches	4 1-2	6	7	9 1-2	12	15	17	19	22	24 1-2	29 1-2

Each of the above packed as follows: 4″, 5″ and 6″, six; 8″, 10″ and 12″, four; 14″ and 16″, two; 18″, 20″ and 24″, one in a box.

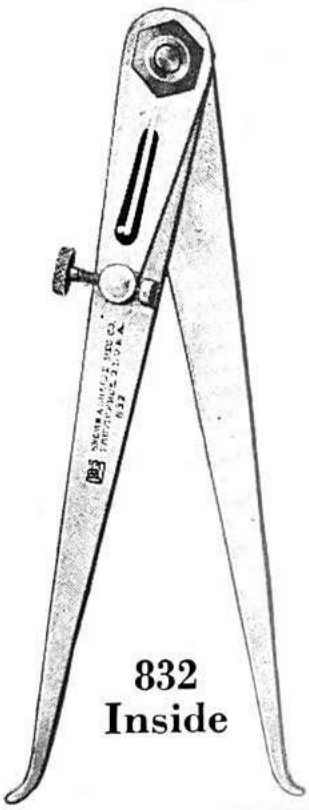
Screw Adjusting Firm-Joint Outside and Inside Calipers Nos. 831 and 832

831

832



831
Outside



832
Inside

No.	Size, Inches	Price	No.	Size, Inches	Price
831	4	$1.10	832	4	$1.10
	5	1.15		5	1.15
	6	1.20		6	1.20
	8	1.50		8	1.50
	10	1.80		10	1.80
	12	2.10		12	2.10
	14	2.40		14	2.40
	16	2.70		16	2.70
	18	3.00		18	3.00
	20	3.30		20	3.30
	24	4.20		24	4.20

Sizes above refer to length of leg. Actual capacities are as follows:

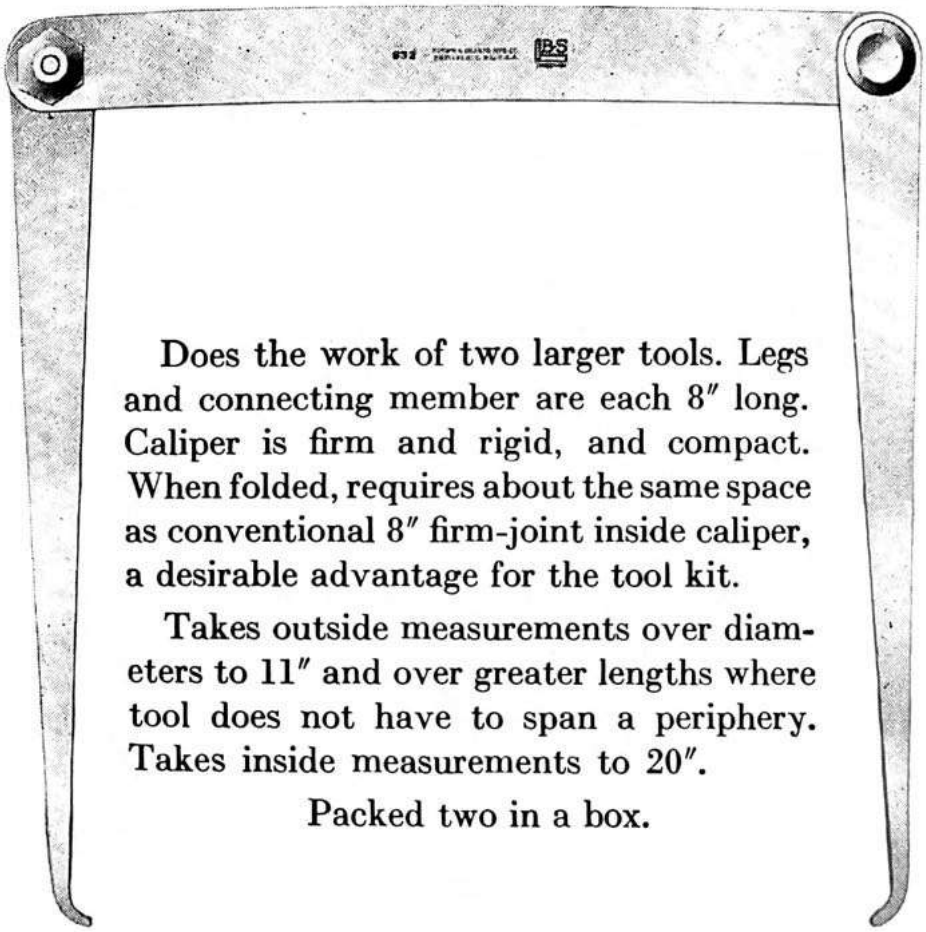
Size . . . . . Inches	4	5	6	8	10	12	14	16	18	20	24
Actual Capacity of Outside Calipers . . . Inches	4 1-2	6	7	9 1-2	12	15	17	19	22	24 1-2	29 1-2

Each of the above packed as follows: 4″, 5″ and 6″, six; 8″, 10″ and 12″ four; 14″ and 16″, two; 18″, 20″ and 24″, one in a box.

Combination Firm-Joint Caliper No. 833

For Inside and Outside Measurements
Price, $2.50

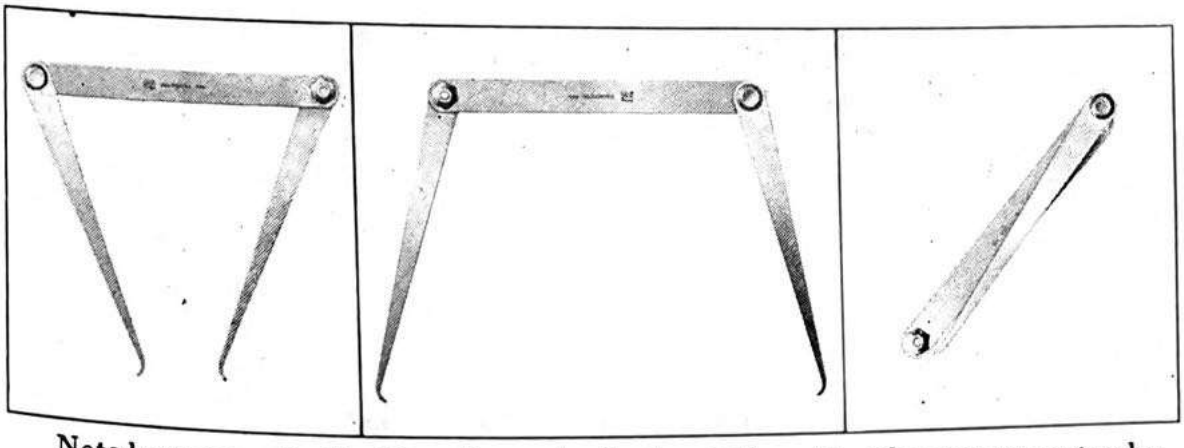
833



Does the work of two larger tools. Legs and connecting member are each 8″ long. Caliper is firm and rigid, and compact. When folded, requires about the same space as conventional 8″ firm-joint inside caliper, a desirable advantage for the tool kit.

Takes outside measurements over diameters to 11″ and over greater lengths where tool does not have to span a periphery. Takes inside measurements to 20″.

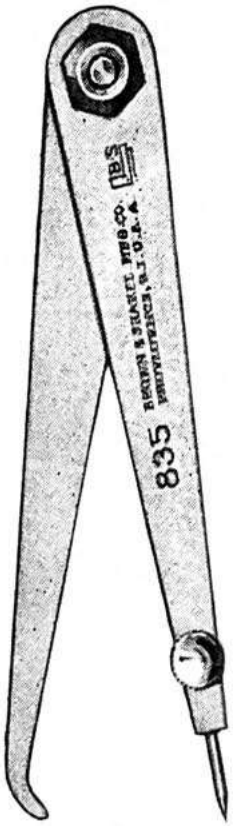
Packed two in a box.



Note how conveniently this caliper takes both outside and inside measurements; also, how compact tool is, when folded.

835

840



Firm-Joint Hermaphrodite Calipers No. 835

No.	Size, Inches	Price with Adjustable Point	Price with Solid Point
835	4	$0.80	$0.60
	6	1.00	.80
	8	1.20	1.00

Duplicate Parts

Clamp Screw . . . . . **15 cents extra**
Point . . . . . **15 cents extra**

Each of the above packed six in a box, except 8″, which is packed four in a box.

Combination Caliper and Divider No. 840

10 Inch

The arms or holders are provided with split chucks to receive the auxiliary legs, each of which is held firmly by a turn of the knurled nut that closes the chuck concentrically. Means are provided for holding outside caliper legs in alignment.

Price

Set Complete $3.60
With Divider Legs only 2.40

Packed one in a box.

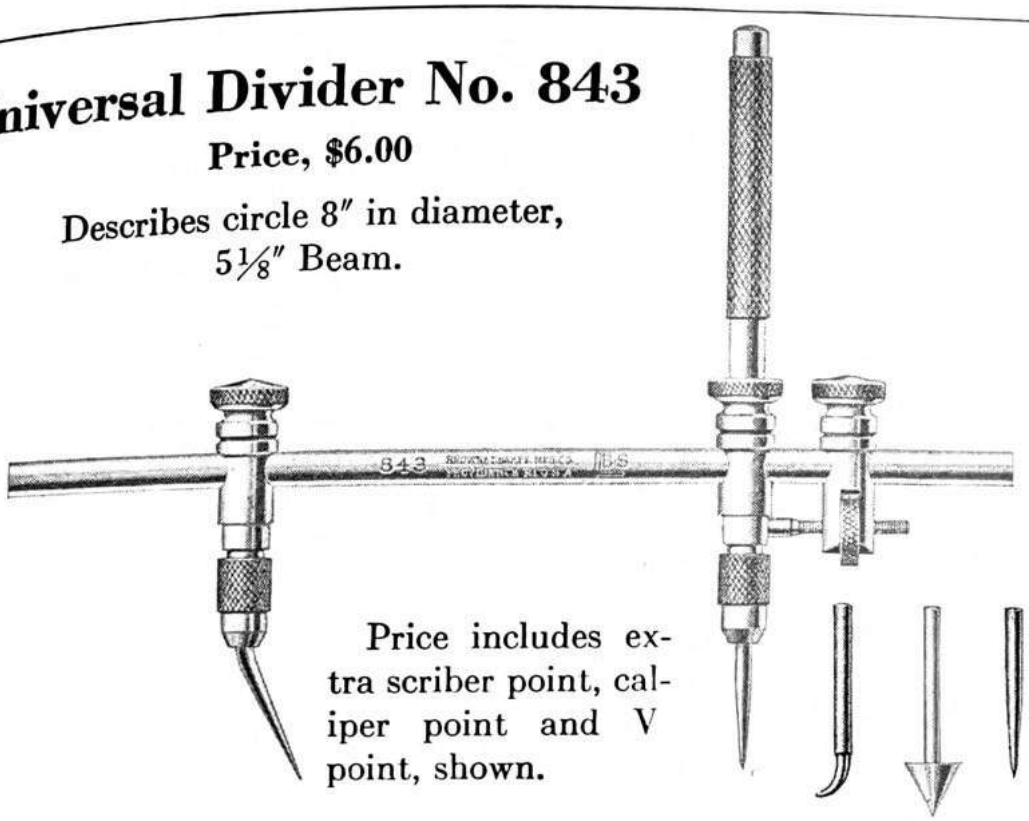
Universal Divider No. 843

Price, $6.00

Describes circle 8″ in diameter,
5⅛″ Beam.

843

843 D



Price includes extra scriber point, caliper point and V point, shown.

Spring friction prevents tram from sliding when loosened. One tram has fine adjustment. Points held by spring chucks and can be easily changed. Offset point can be used for scribing small circles or for working close to shoulder. V point centers in holes to ¼″ diameter (see page 443 for special points).

Packed one in a box.

Extension

With extension, Divider describes circle 37″ in diameter. **Price,** Extension only, (includes coupling) **$1.50**

In ordering, specify Extension for No. 843 Divider.

Packed one in tubular container.

Universal Divider No. 843D—for Draftsmen

Universal Dividers can be furnished with Pencil Lead Chuck, Needle Point and Pen Attachment (see page 443) in place of one Scriber Chuck and Scribers, Caliper and V Points. **Price** **$6.00**

In ordering, specify No. 843D.

Packed one in a box

Finished Wooden Case for No. 843 or No. 843D. Has space for extra Points. . . . . Extra **$1.25**

Steel Beam Trammels No. 845

845

845 D

Prices

With 9″ Beam, $4.00 — 9″ Beam, 7/32″ Dia.
Describes circle 18″ in diam.

With 14″ Beam, $6.00 — 14″ Beam, 13/64″ Dia.
Describes circle 26″ in diam.

With 20″ Beam, $7.00 — 20″ Beam, 5/16″ Dia.
Describes circle 36″ in diam.

Spring friction prevents trams from sliding when loosened. Points held by spring chucks. Two scribers and two caliper points furnished. (See page 443 for special points.) Packed one in a box.

Extensions

With extension, 14″ Trammel describes circle 54″ in diameter.
Price, Extension only (includes coupling) $1.50
Packed one in tubular container.

With extension, 20″ Trammel describes circle 72″ in diameter.
Price, Extension only (includes coupling) $1.50

In ordering, specify whether for 14″ or 20″ Trammel.
Packed one in a box.

Steel Beam Trammels No. 845D—for Draftsmen

14″ Trammel can be furnished with Pencil Lead Chuck, Needle Point and Pen Attachment (see page 443) in place of one Scriber Chuck, Scribers and Caliper Points. **Price** $6.00

20″ Trammel can be furnished with Needle Point and Pen Attachment (see page 443) in place of one Scriber Chuck, Scribers and Caliper Points. **Price** $9.00

In ordering, specify No. 845D and size required.
Packed one in a box.

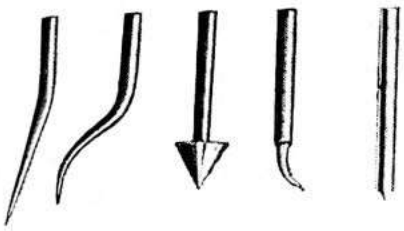
Finished Wooden Case for No. 845 or No. 845D—14″. Has space for extra Points and Extension . . . . . Extra, $1.75

Finished Wooden Case for No. 845 or No. 845D—20″. Has space for extra Points (except V Points) and Extension . . Extra, $2.75

Points and Attachments

For Universal Dividers and Steel Beam Trammels

For Dividers No. 843 and Trammels No. 845—14″



Half Offset Point | Offset Point | V Point | Caliper Point | Needle Point

Half Offset Point. Price, each, 30 cents
Offset Point. . . . . Price, each, 30 cents
V Point, centers in holes to ¼″ dia. . . . . **Price, each, 40 cents**
Caliper Point. . . . Price, each, 30 cents
Needle Point . . . . Price, each, 30 cents
Straight Scriber Point Price, each, 20 cents

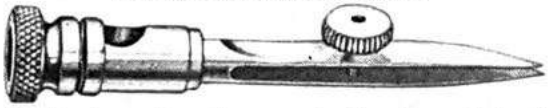
Packed one in a package.

Pencil Lead Chuck

Spring friction prevents attachment from sliding when loosened. Takes leads .075″ in dia. (cannot be used for other points). **Price . . . 60 cents**

Packed one in a box.

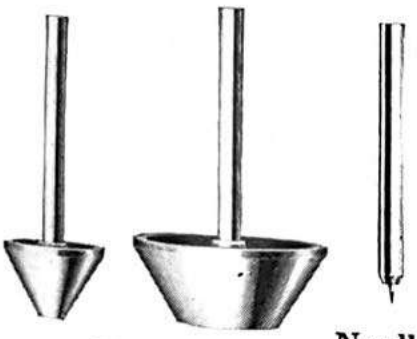
Pen Attachment



Tram Handle fits hole in attachment. Spring friction prevents sliding.
Price $1.80

Packed one in a package.

For Trammels No. 845—20″



V Points | Needle Point

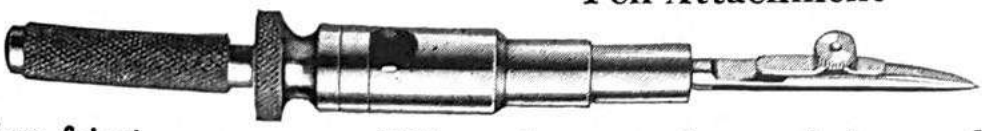
V Points, center in holes from ¼″ to 1⅝″ dia. **Price, per pair $3.00**

Packed one pair in a box.

Needle Point . . . . Price, each, 75 cents
Caliper Point. . . . Price, each, 30 cents
Straight Scriber Point Price, each, 30 cents

Packed one in a package.

Pen Attachment



Spring friction prevents sliding when attachment is loosened. Pen point has quick release for cleaning. **Price $4.00**

Packed one in a box.

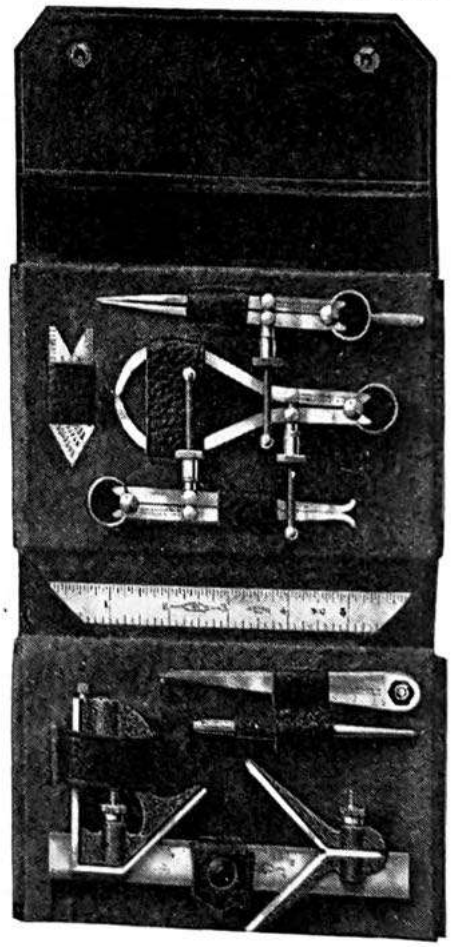
Set of Standard Tools No. 847

FOR STUDENTS AND APPRENTICES

847

Price, $8.75

A set of tools that the experience of the shop man has proved to be essential equipment for the beginner.



It is neatly arranged in a folding leatherette case as shown in the cuts. Size folded, about 7″ x 4¾″ x 1⅜″.

Contains the following tools:

No. 300—6″ Tempered Steel Rule, No. 4 Graduation.

No. 402—6″ Combination Square, No. 4 Graduation (with heads not hardened).

No. 650—60° Center Gage (Tempered).

No. 765C—Center Punch.

No. 810—4″ Divider, solid nut.

No. 811—4″ Outside Caliper, solid nut.

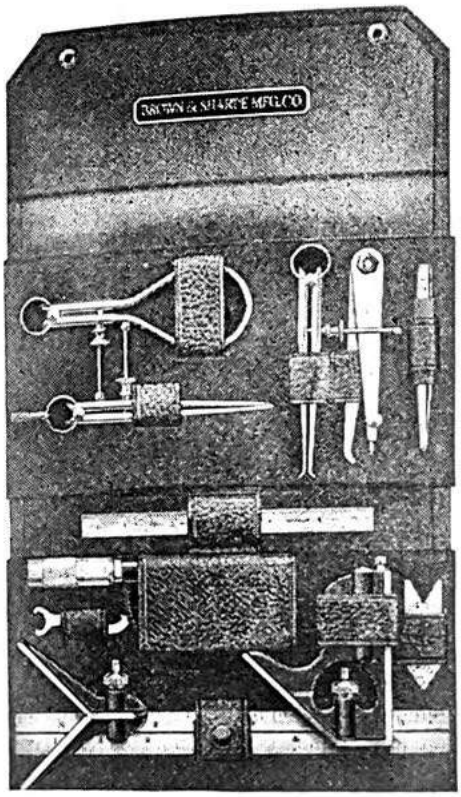
No. 812—4″ Inside Caliper, solid nut.

No. 835—4″ Hermaphrodite Caliper, solid point.

Packed one set in a box.

Set of Standard Tools No. 848

FOR STUDENTS AND APPRENTICES



Price, $19.50

This set of tools answers the requirements of technical student or apprentice; it provides a modest set of fine quality frequently used tools, including a 1″ Micrometer for precision work. Neatly arranged in folding leatherette case. Size when folded, about 9¼″ x 7″ x 1½″. 848 849

Contains the Following Tools:

No. 11 Micrometer Caliper
No. 306 6″ Flexible Steel Rule, No. 10 Grad.
No. 402 9″ Combination Square, No. 4 Grad. (with heads not hardened)
No. 650 60° Tempered Center Gage
No. 765D Center Punch
No. 800 4″ Toolmakers' Divider
No. 801 4″ Toolmakers' Outside Caliper
No. 802 4″ Toolmakers' Inside Caliper
No. 835 4″ Hermaphrodite Caliper, Adj. Point

Set of Standard Tools No. 849

FOR STUDENTS AND APPRENTICES

Price, $10.00

Contains the following:

No. 300 6″ Tempered Steel Rule, No. 4 Grad.
No. 402 6″ Combination Square, No. 4 Grad. (with heads not hardened)
No. 650 60° Center Gage (Tempered).
No. 765C Center Punch.
No. 810 5″ Divider, solid nut.
No. 811 6″ Outside Caliper, solid nut.
No. 812 6″ Inside Caliper, solid nut.
Brown & Sharpe Handbook.
Furnished in a finished wooden case.

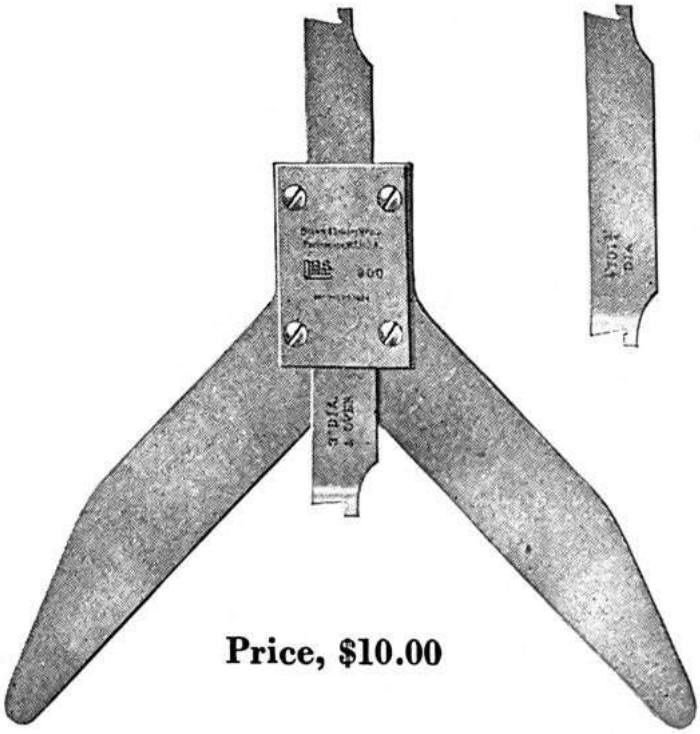
The Brown & Sharpe Handbook contains many useful hints and instructions on a large variety of operations common to machine shop practice.

Each of the above packed one set in a box.

Cutter Clearance Gage No. 900

Patented

900



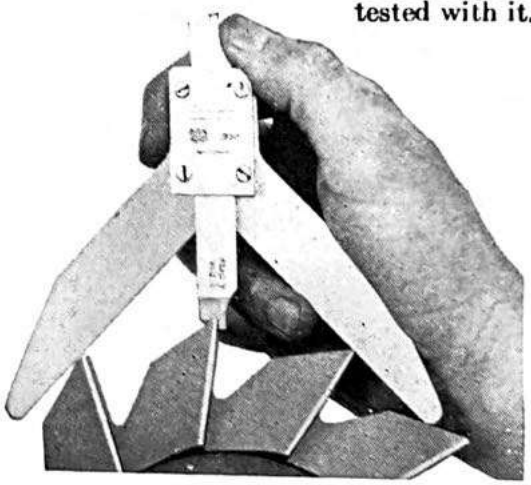
Price, $10.00

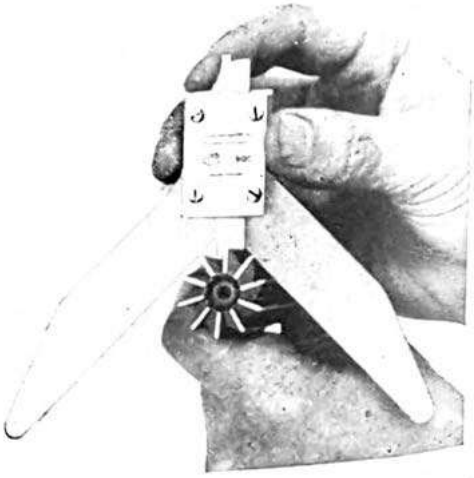
This handy gage determines the correct angle of clearance in grinding milling cutters, and is very simple to use. The inside surfaces of the V are brought in contact with the cutter, and the gage blade is dropped upon the tooth being gaged. The cutter is revolved sufficiently to bring the face of the tooth in contact with the gage blade. The angle of clearance in the tooth should correspond with the angle of the gage.

It may be used for right- and left-hand cutters and for end mills of all styles. The V-shaped body locates the cutter and holds the gage blade in correct relation to the center line of the cutter. All contact surfaces are hardened and ground. Two gage blades are furnished with each gage and are stamped at each end with the diameters of the cutters for which they are intended. This clearance gage will measure all style cutters, except helical mills, from ½″ up to 8″ in diameter, and of any width.

Packed one in a box.

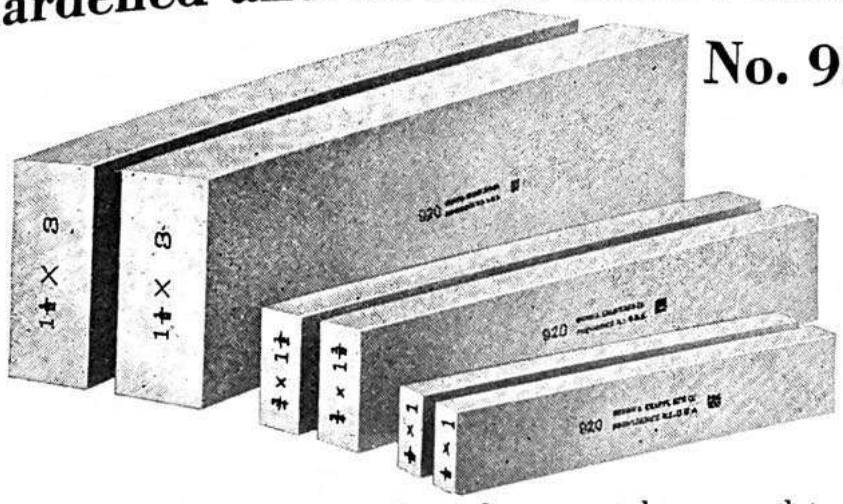
Notice how simple this gage is to use and how conveniently either large or small cutters are tested with it.





Hardened and Ground Steel Parallels

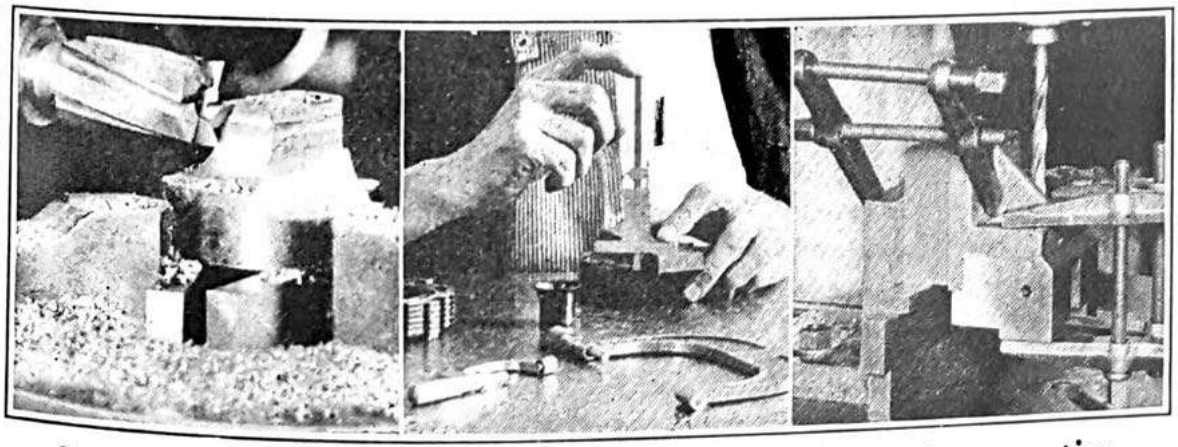
No. 920



920

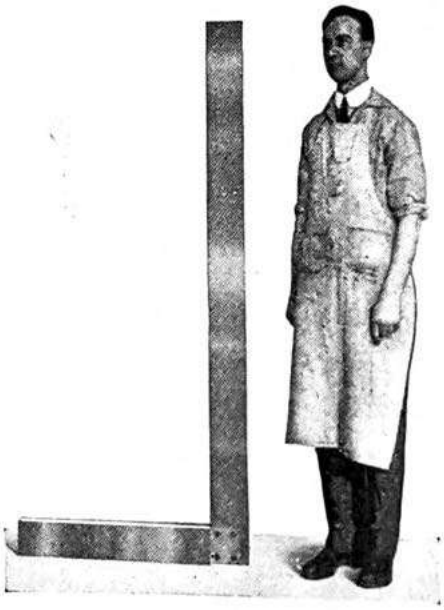
Made of special steel, hardened, and accurately ground to very close limits on four sides. These parallels are straight and true, and are practically interchangeable. Sizes especially selected for their convenience and general usefulness. Each parallel comes in a separate package.

Length, In.	Size, Inches	Price, Each	Length, In.	Size, Inches	Price, Each
6	1-4 x 3-8	$3.00	9	3-4 x 1 1-2	$6.50
6	1-4 x 1-2	3.00	12	11-16 x 1 1-4	7.25
6	1-4 x 5-8	3.00	12	3-4 x 1	7.00
6	1-4 x 3-4	3.50	12	3-4 x 1 1-4	7.50
6	3-8 x 1-2	3.50	12	13-16 x 1 1-4	7.75
6	3-8 x 5-8	3.50	12	1 x 1 1-4	8.00
6	3-8 x 3-4	3.50	12	1 x 1 1-2	8.50
6	1-2 x 5-8	4.00	12	1 x 2	9.50
6	1-2 x 3-4	4.00	12	1 1-4 x 1 1-2	9.00
6	1-2 x 1	4.00	12	1 1-4 x 1 3-4	9.50
9	1-2 x 5-8	5.00	12	1 1-4 x 2	10.50
9	1-2 x 3-4	5.00	12	1 1-4 x 2 1-2	12.00
9	1-2 x 1	5.00	12	1 1-2 x 2	12.00
9	3-4 x 1	6.00	12	1 1-2 x 3	15.00
9	3-4 x 1 1-4	6.00			



Steel Parallels are handy in every phase of machine shop practice.

Special Tools

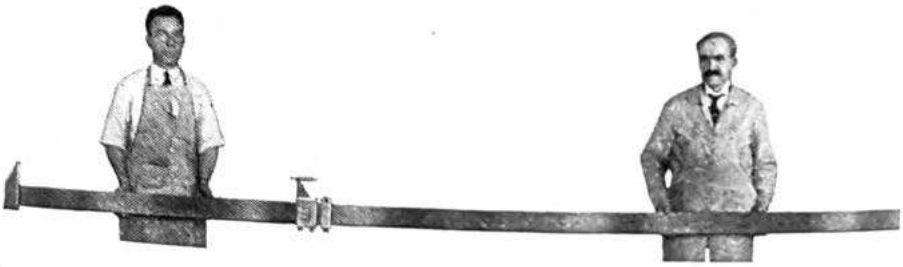


The production of this large Try Square demanded not only accurate workmanship but exceptional knowledge of tool design as well.

Our equipment and many years' experience enable us to manufacture, at the lowest possible cost, special tools and gages in sizes not listed in this catalog. We have made them of unusually large proportions and designed for special purposes in widely diversified fields of industry.

We are glad to furnish quotations upon receipt of information or blue prints showing the tool or gage desired We urge our customers, however, to order stock tools whenever possible, as they are of proven worth and of designs found best adapted to the work for which they are intended.

A special Vernier Caliper that measures by thousandths of an inch to 156 inches.



A Micrometer Caliper of special design for measuring from 0 to 144 inches by thousandths of an inch. Quarter thousandths are readily estimated on this tool.

Cutters and Hobs

B·S

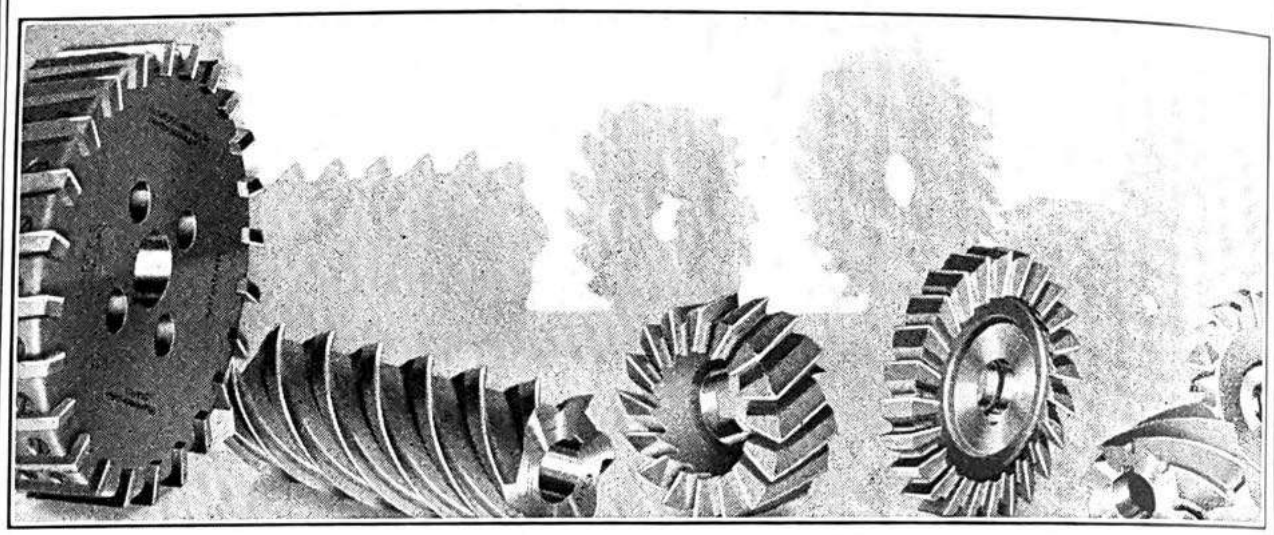
Brown & Sharpe Cutters

and Hobs

are Modern and Efficient—

They Keep Costs Low

Cutters



The sizes of cutters listed in this catalog are in accordance with Simplified Practice Recommendation endorsed by the U. S. Department of Commerce.

WE regularly carry in stock the cutters shown in this catalog, which are listed in accordance with the Simplified Practice Division of the United States Department of Commerce. We can make, also, cutters of any size or shape or arrange for any combination of cutters.

Our cutter department is equipped with special machinery and many appliances that are the outgrowth of over 70 years experience in the manufacture of this class of tools.

Brown & Sharpe Cutters are made with the experience we gain both as manufacturers and users. Employing thousands of cutters of all types every day in our own plant, it is necessary that we use only cutters that will keep our costs down to the lowest possible limits. The large fund of first-hand information we obtain covering performance under all conditions enables us to assure our customers the best in cutter equipment.

Stocks of our regular cutters are carried by the leading hardware and supply dealers throughout the country and can usually be purchased most advantageously from the dealers. It is also frequently advantageous to order special cutters through the dealers.

Special Cutters

WHEN ordering special cutters, particularly if several cutters are to be used in a gang, it is very desirable that we have a drawing of the work to be produced. When this information is not available we frequently find that it is not possible to tell just which portions of the cutter outline are cutting edges or to decide various other essential points entering into the cutter design.

In those cases where our customers furnish drawings of their cutters a satisfactory substitute for a drawing of the work is to show the outline of the work in relation to the cutters.

Keep Cutters Sharpened Properly

A DULL cutter wears very rapidly and produces a poor finish and inaccurate dimensions. Therefore proper sharpening at suitable intervals is real economy.

Experience is required to determine when a cutter has reached the point where sharpening is desirable. This, however, is soon acquired if the cutters are closely observed. A practice sometimes followed with satisfaction where parts are being milled in large quantities is to establish a length of time which the cutters can be safely operated between sharpenings and to then adhere to this sharpening schedule without stopping the cutters to observe their condition. Formed cutters should have their teeth ground radially and so that they are all of the same height. An exception to this practice is found in those cases where these cutters are designed to be sharpened back of center, in which case they are marked to indicate the amount of rake used. Further information on page 501.

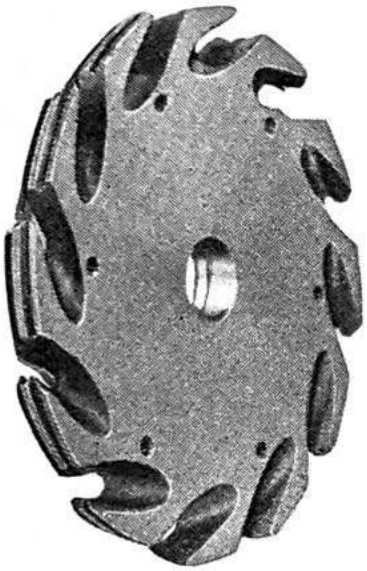
Lubricant

WITH all of our cutters lubricant should be used freely when milling Wrought Iron or Steel. Lard oil is usually the best; but in many cases the following Soda-Water mixture answers very well and is less expensive:

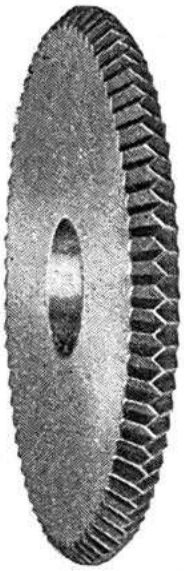
One quarter pound Sal-Soda. One half pint Lard Oil. One half pint Soft Soap. Water enough to make ten quarts. Boil one half hour.

Cutters for Special Purposes

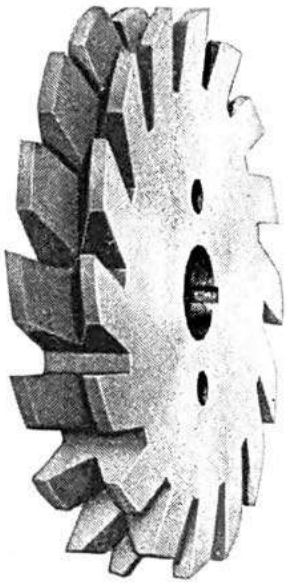
A few cutters developed for special needs of manufacturers.



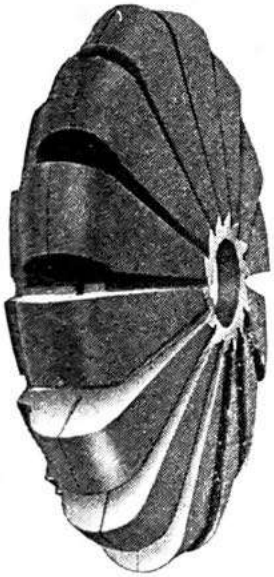
Mills Wooden Collar Buttons.



Scallops Edge of Cloth or Bandage and Prevents Raveling.

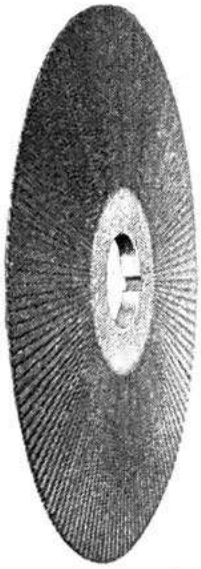


Mills Bamboo. Extreme Undercut Required for Good Finish.



Mills Molds for Tile Moldings.

Cuts Special Pipe Threads.



Mills Between Fork Tines.

Nearly every operation can be performed with several different cutters, but usually only one is economical, and it is the problem of proper designing to develop this cutter.

As pioneers in the cutter industry, we have made cutters for practically every branch of industry and have available data which assists in developing cutters for special purposes. We can analyze your special cutter problem and give it the proper solution.

Clearance on Cutters

WHEN sharpening cutters, the clearance should always be taken into consideration. Clearance, or relief, on milling cutters is the amount of material removed from the top of the teeth back of the cutting edge, to permit the teeth to clear the stock and not scrape over it after the cutting edge has done its work. On formed and gear cutters, clearance does not have to be considered in resharpening, because the teeth are so formed that when ground radially on the faces the clearance remains the same.

The angle of clearance depends upon the diameter of the cutters and must be greater for small cutters than for large ones. The clearance on the teeth of plain milling cutters should be 4 degrees for cutters over 3 inches in diameter, and 6 degrees for those under 3 inches, and the land at the top of the teeth should be from .02 to .04-inch wide before the clearance is cut or ground. In the case of the smaller end mills and other cutters of similar diameters an increase above the 6° angle will frequently be necessary to insure the back corner of the sharpened land being lower than the cutting edge. The clearance of the end teeth of end mills should be about 2 degrees, and it is well to have the teeth a little hollowing, letting them be .001 or .002-inch lower near the center than at the outside, so that the inner ends of the teeth will not drag on the work. This can be done by setting the swivel on the cutter grinding machine slightly away from 90 degrees. If the clearance of a cutter is too great, vibrations are likely to occur in operation. By all means these should be prevented.

Feeds and Speeds

THE Feeds and Speeds of cutters cannot be governed by any definite rules, but, in a general way, the following surface speeds will serve to give an idea, or basis, to work from. They may be varied slightly to suit the requirements of the work in hand. Using Carbon Steel Cutters: For brass, 80 feet to 100 feet per minute; for cast iron, 40 feet to 60 feet per minute; for machinery steel, 30 feet to 40 feet per minute; and for annealed tool steel, 20 feet to 30 feet per minute have been found satisfactory. With High Speed Steel Cutters for the same materials, the following speeds are advocated: For brass, 150 feet to 200 feet per minute; for cast iron, 80 feet to 100 feet per minute; for machinery steel, 80 feet to 100 feet per minute; and for annealed tool steel, 60 feet to 80 feet per minute.

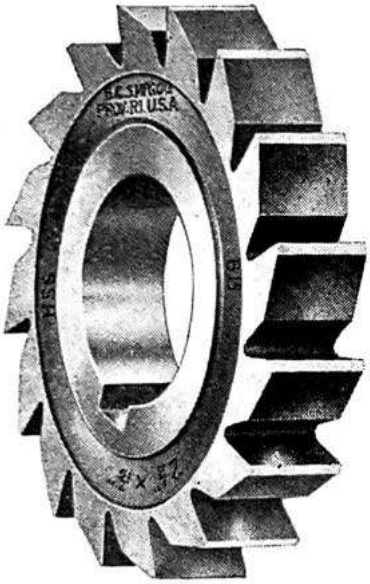
Tables for determining the number of revolutions per minute to obtain the more common surface speeds of cutters of different diameters will be found on pages 454 and 455.

Table of Cutting Speeds

Feet per Minute	15	17.5	20	22.5	25	27.5	30	35	40	45	50	55
Diam., Inches	REVOLUTIONS PER MINUTE											
1-16	917	1070	1222	1375	1528	1681	1833	2139	2445	2750	3056	3361
1-8	458	535	611	688	764	840	917	1070	1222	1375	1528	1681
3-16	306	357	407	458	509	560	611	713	815	917	1019	1120
1-4	229	267	306	344	382	420	458	535	611	688	764	840
5-16	183	214	244	275	306	336	367	428	489	550	611	672
3-8	153	178	204	229	255	280	306	357	407	458	509	560
7-16	131	153	175	196	218	240	262	306	349	393	437	480
1-2	115	134	153	172	191	210	229	267	306	344	382	420
5-8	91.7	107	122	138	153	168	183	214	244	275	306	336
3-4	76.4	89.1	102	115	127	140	153	178	204	229	255	280
7-8	65.5	76.4	87.3	98.2	109	120	131	153	175	196	218	240
1	57.3	66.8	76.4	85.9	95.5	105	115	134	153	172	191	210
1 1-8	50.9	59.4	67.9	76.4	84.9	93.4	102	119	136	153	170	187
1 1-4	45.8	53.5	61.1	68.8	76.4	84.0	91.7	107	122	138	153	168
1 3-8	41.7	48.6	55.6	62.5	69.5	76.4	83.3	97.2	111	125	139	153
1 1-2	38.2	44.6	50.9	57.3	63.7	70.0	76.4	89.1	102	115	127	140
1 5-8	35.3	41.1	47.0	52.9	58.8	64.6	70.5	82.3	94.0	106	118	129
1 3-4	32.7	38.2	43.7	49.1	54.6	60.0	65.5	76.4	87.3	98.2	109	120
1 7-8	30.6	35.7	40.7	45.8	50.9	56.0	61.1	71.3	81.5	91.7	102	112
2	28.7	33.4	38.2	43.0	47.7	52.5	57.3	66.8	76.4	85.9	95.5	105
2 1-4	25.5	29.7	34.0	38.2	42.4	46.7	50.9	59.4	67.9	76.4	84.9	93.4
2 1-2	22.9	26.7	30.6	34.4	38.2	42.0	45.8	53.5	61.1	68.8	76.4	84.0
2 3-4	20.8	24.3	27.8	31.3	34.7	38.2	41.7	48.6	55.6	62.5	69.5	76.4
3	19.1	22.3	25.5	28.6	31.8	35.0	38.2	44.6	50.9	57.3	63.7	70.0
3 1-4	17.6	20.6	23.5	26.4	29.4	32.3	35.3	41.1	47.0	52.9	58.8	64.6
3 1-2	16.4	19.1	21.8	24.5	27.3	30.0	32.7	38.2	43.7	49.1	54.6	60.0
3 3-4	15.3	17.8	20.4	22.9	25.5	28.0	30.6	35.7	40.7	45.8	50.9	56.0
4	14.3	16.7	19.1	21.5	23.9	26.3	28.7	33.4	38.2	43.0	47.7	52.5
4 1-2	12.7	14.9	17.0	19.1	21.2	23.3	25.5	29.7	34.0	38.2	42.4	46.7
5	11.5	13.4	15.3	17.2	19.1	21.0	22.9	26.7	30.6	34.4	38.2	42.0
5 1-2	10.4	12.2	13.9	15.6	17.4	19.1	20.8	24.3	27.8	31.3	34.7	38.2
6	9.5	11.1	12.7	14.3	15.9	17.5	19.1	22.3	25.5	28.6	31.8	35.0
6 1-2	8.8	10.3	11.8	13.2	14.7	16.2	17.6	20.6	23.5	26.4	29.4	32.3
7	8.2	9.5	10.9	12.3	13.6	15.0	16.4	19.1	21.8	24.5	27.3	30.0
7 1-2	7.6	8.9	10.2	11.5	12.7	14.0	15.3	17.8	20.4	22.9	25.5	28.0
8	7.2	8.4	9.5	10.7	11.9	13.1	14.3	16.7	19.1	21.5	23.9	26.3
8 1-2	6.7	7.9	9.0	10.1	11.2	12.4	13.5	15.7	18.0	20.2	22.5	24.7
9	6.4	7.4	8.5	9.5	10.6	11.7	12.7	14.9	17.0	19.1	21.2	23.3
9 1-2	6.0	7.0	8.0	9.1	10.1	11.1	12.1	14.1	16.1	18.1	20.1	22.1
10	5.7	6.7	7.6	8.6	9.5	10.5	11.5	13.4	15.3	17.2	19.1	21.0
11	5.2	6.1	6.9	7.8	8.7	9.5	10.4	12.2	13.9	15.6	17.4	19.1
12	4.8	5.6	6.4	7.2	8.0	8.8	9.5	11.1	12.7	14.3	15.9	17.5
13	4.4	5.1	5.9	6.6	7.3	8.1	8.8	10.3	11.8	13.2	14.7	16.2
14	4.1	4.8	5.5	6.1	6.8	7.5	8.2	9.5	10.9	12.3	13.6	15.0
15	3.8	4.5	5.1	5.7	6.4	7.0	7.6	8.9	10.2	11.5	12.7	14.0
16	3.6	4.2	4.8	5.4	6.0	6.6	7.2	8.4	9.5	10.7	11.9	13.1
17	3.4	3.9	4.5	5.1	5.6	6.2	6.7	7.9	9.0	10.1	11.2	12.4
18	3.2	3.7	4.2	4.8	5.3	5.8	6.4	7.4	8.5	9.5	10.6	11.7
Feet per Minute	15	17.5	20	22.5	25	27.5	30	35	40	45	50	55

Table of Cutting Speeds (*Continued*)

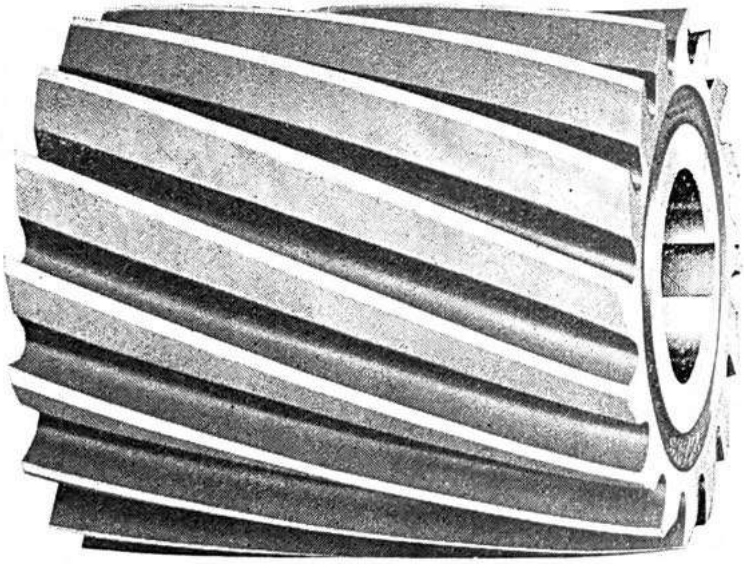
Feet per Minute	60	65	70	75	80	90	100	110	120	130	140	150
Diam., Inches	REVOLUTIONS PER MINUTE											
1-16	3667	3973	4278	4584	4889	...	...	...	...	...	...	...
1-8	1833	1986	2139	2292	2445	2750	3056	3361	3667	3973	1278	4584
3-16	1222	1324	1426	1528	1630	1833	2037	2241	2445	2648	2852	3056
1-4	917	993	1070	1146	1222	1375	1528	1681	1833	1986	2139	2292
5-16	733	794	856	917	978	1100	1222	1345	1467	1589	1711	1833
3-8	611	662	713	764	815	917	1019	1120	1222	1324	1426	1528
7-16	524	568	611	655	698	786	873	960	1048	1135	1222	1310
1-2	458	497	535	573	611	688	764	840	917	993	1070	1146
5-8	367	397	428	458	489	550	611	672	733	794	856	917
3-4	306	331	357	382	407	458	509	560	611	662	713	764
7-8	262	284	306	327	349	393	437	480	524	568	611	655
1	229	248	267	287	306	344	382	420	458	497	535	573
1 1-8	204	221	238	255	272	306	340	373	407	441	475	509
1 1-4	183	199	214	229	244	275	306	336	367	397	428	458
1 3-8	167	181	194	208	222	250	278	306	333	361	389	417
1 1-2	153	166	178	191	204	229	255	280	306	331	357	382
1 5-8	141	153	165	176	188	212	235	259	282	306	329	353
1 3-4	131	142	153	164	175	196	218	240	262	284	306	327
1 7-8	122	132	143	153	163	183	204	224	244	265	285	306
2	115	124	134	143	153	172	191	210	229	248	267	287
2 1-4	102	110	119	127	136	153	170	187	204	221	238	255
2 1-2	91.7	99.3	107	115	122	138	153	168	183	199	214	229
2 3-4	83.3	90.3	97.2	104	111	125	139	153	167	181	194	208
3	76.4	82.8	89.1	95.5	102	115	127	140	153	166	178	191
3 1-4	70.5	76.4	82.3	88.2	94.0	106	118	129	141	153	165	176
3 1-2	65.5	70.9	76.4	81.9	87.3	98.2	109	120	131	142	153	164
3 3-4	61.1	66.2	71.3	76.4	81.5	91.7	102	112	122	132	143	153
4	57.3	62.1	66.8	71.6	76.4	85.9	95.5	105	115	124	134	143
4 1-2	50.9	55.2	59.4	63.6	67.9	76.4	84.9	93.4	102	110	119	127
5	45.8	49.7	53.5	57.3	61.1	68.8	76.4	81.0	91.7	99.3	107	115
5 1-2	41.7	45.1	48.6	52.1	55.6	62.5	69.5	76.4	83.3	90.3	97.2	104
6	38.2	41.4	44.6	47.8	50.9	57.3	63.7	70.0	76.4	82.8	89.1	95.5
6 1-2	35.3	38.2	41.1	44.1	47.0	52.9	58.8	64.6	70.5	76.4	82.3	88.2
7	32.7	35.5	38.2	40.9	43.7	49.1	54.6	60.0	65.5	70.9	76.4	81.9
7 1-2	30.6	33.1	35.7	38.2	40.7	45.8	50.9	56.0	61.1	66.2	71.3	76.4
8	28.7	31.0	33.4	35.8	38.2	43.0	47.7	52.5	57.3	62.1	66.8	71.6
8 1-2	27.0	29.2	31.5	33.7	35.0	40.4	44.9	49.4	53.9	58.4	62.9	67.4
9	25.5	27.6	29.7	31.8	34.0	38.2	42.4	46.7	50.9	55.2	59.4	63.6
9 1-2	24.1	26.1	28.2	30.2	32.2	36.2	40.2	44.2	48.3	52.3	56.3	60.3
10	22.9	24.8	26.7	28.7	30.6	34.4	38.2	42.0	45.8	49.7	53.5	57.3
11	20.8	22.6	24.3	26.0	27.8	31.3	34.7	38.2	41.7	45.1	48.6	52.1
12	19.1	20.7	22.3	23.9	25.5	28.6	31.8	35.0	38.2	41.4	44.6	47.8
13	17.6	19.1	20.6	22.0	23.5	26.4	29.4	32.3	35.3	38.2	41.1	44.1
14	16.4	17.7	19.1	20.5	21.8	24.5	27.3	30.0	32.7	35.5	38.2	40.9
15	15.3	16.6	17.8	19.1	20.4	22.9	25.5	28.0	30.6	33.1	35.7	38.2
16	14.3	15.5	16.7	17.9	19.1	21.5	23.9	26.3	28.7	31.0	33.4	35.8
17	13.5	14.6	15.7	16.9	18.0	20.2	22.5	24.7	27.0	29.2	31.5	33.7
18	12.7	13.8	14.9	15.9	17.0	19.1	21.2	23.3	25.5	27.6	29.7	31.8
Feet per Minute	60	65	70	75	80	90	100	110	120	130	140	150



Plain Milling Cutters

Milling Cutters of less than ¾″ face have straight teeth.

Milling Cutters of ¾″ face and over have spiral teeth.



No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
M-10	2 1-4	1-2	7-8	**$2.30**	$4.50
M-11	2 1-4	1	7-8	**3.00**	6.00
M-14	2 1-2	3-16	1	**1.60**	3.10
M-15	2 1-2	1-4	1	**2.10**	4.10

List continued on next page.

Other sizes made to order.

List of Keyways, page 489.

Plain Milling Cutters (*Continued*)

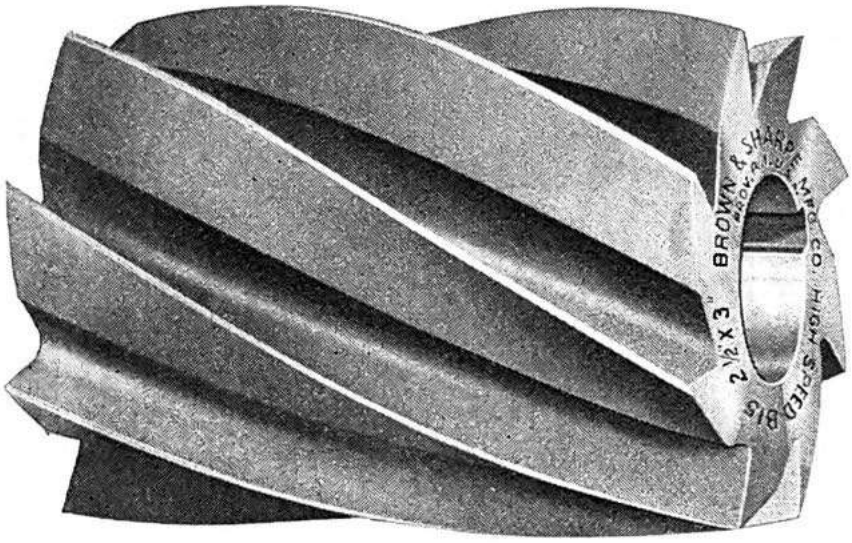
No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
M-16	2 1-2	5-16	1	$2.20	$4.30
M-17	2 1-2	3-8	1	2.30	4.60
M-18	2 1-2	7-16	1	2.50	4.90
M-19	2 1-2	1-2	1	2.60	5.10
M-21	2 1-2	5-8	1	2.80	5.60
M-23	2 1-2	3-4	1	3.00	6.00
M-26	2 1-2	1	1	3.50	6.90
M-29	2 1-2	1 1-2	1	4.30	8.60
M-31	2 1-2	2	1	5.20	10.30
M-33	2 1-2	2 1-2	1	6.10	12.10
M-35	2 1-2	3	1	6.90	13.70
M-61	3	3-16	1	1.90	3.80
M-62	3	1-4	1	2.50	5.00
M-63	3	5-16	1	2.70	5.40
M-63A	3	3-8	1	2.90	5.70
M-64	3	3-8	1 1-4	2.90	5.70
M-65	3	7-16	1 1-4	3.00	6.00
M-66	3	1-2	1 1-4	3.20	6.40
M-68	3	5-8	1 1-4	3.50	6.90
M-70	3	3-4	1 1-4	3.80	7.50
M-71	3	7-8	1 1-4	4.10	8.10
M-72	3	1	1 1-4	4.40	8.70
M-73	3	1 1-4	1 1-4	5.00	9.90
M-74	3	1 1-2	1 1-4	5.50	11.00
M-76	3	2	1 1-4	6.70	13.40
M-78	3	3	1 1-4	9.10	18.10
M-104A	4	1-4	1	3.60	7.10
M-105	4	1-4	1 1-4	3.60	7.10
M-104B	4	5-16	1	3.90	7.70
M-106	4	5-16	1 1-4	3.90	7.70
M-104C	4	3-8	1	4.10	8.20
M-107	4	3-8	1 1-4	4.10	8.20
M-109	4	1-2	1 1-4	4.70	9.30
M-112	4	5-8	1 1-4	5.10	10.20
M-114	4	3-4	1 1-4	5.60	11.20
M-117	4	1	1 1-4	6.60	13.10
M-121	4	1 1-2	1 1-4	8.60	17.10
M-125	4	2	1 1-4	10.50	21.00
M-128	4	3	1 1-4	14.50	28.90
M-130	4	4	1 1-4	18.40	36.80

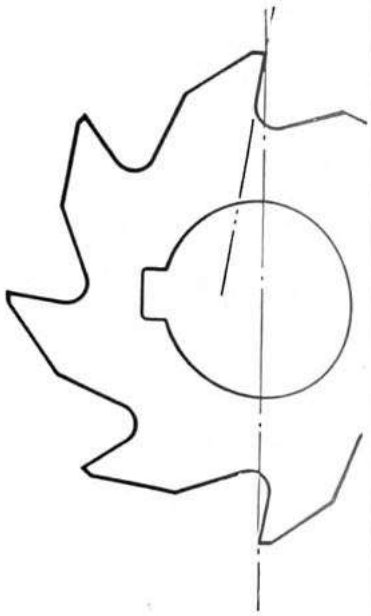
Other sizes made to order.

List of Keyways, page 489.

Coarse-Tooth Milling Cutters

HIGH SPEED STEEL





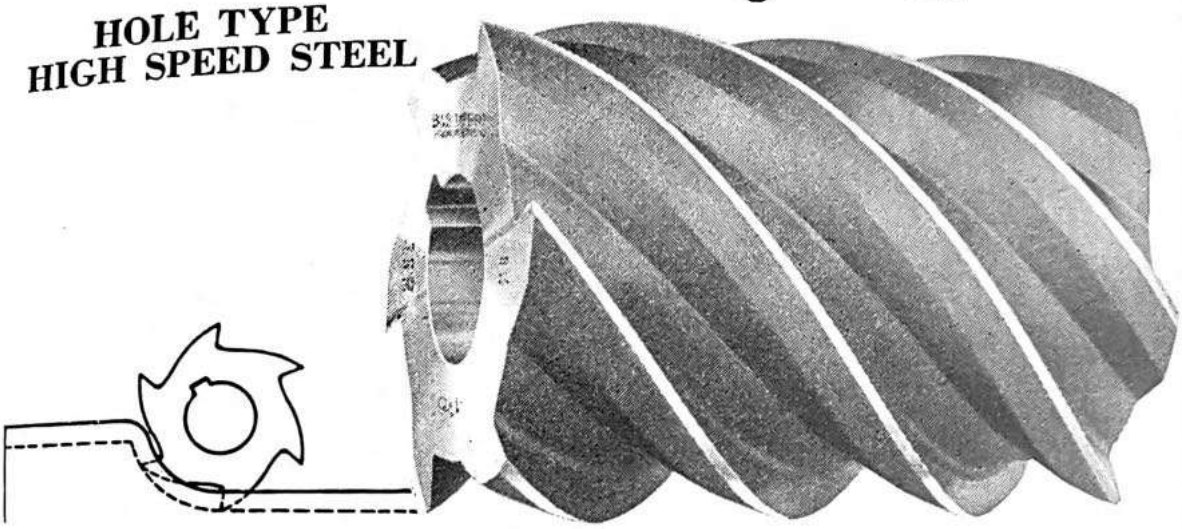
No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each High Speed Steel
M-254	2 1-2	2	1	$10.30
M-257	2 1-2	4	1	17.30
M-261	3	2	1 1-4	13.40
M-262	3	2 1-2	1 1-4	15.80
M-263	3	3	1 1-4	18.10
M-264	3	4	1 1-4	22.80
M-266	3	6	1 1-4	33.60
*M-278	4	2	1 1-2	21.00
M-279	4	3	1 1-2	28.90
M-280	4	4	1 1-2	36.80
M-282	4	6	1 1-2	53.90

*Made to order only. Other sizes made to order.

List of Keyways, page 489.

Helical Plain Milling Cutters

HOLE TYPE HIGH SPEED STEEL

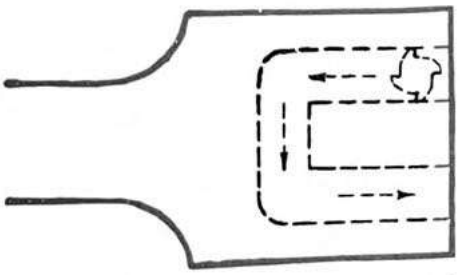


Especially proficient in taking slabbing cuts, producing a fine finish without chatter. They can be used to particular advantage in removing an uneven amount of stock without gouging, as shown above.

No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each High Speed Steel
M-300	3	4	1 1-4	$25.10
M-306	4	4	1 1-2	40.50
M-308	4	6	1 1-2	59.30
M-310	4	8	1 1-2	80.60
M-312	4	10	1 1-2	101.90

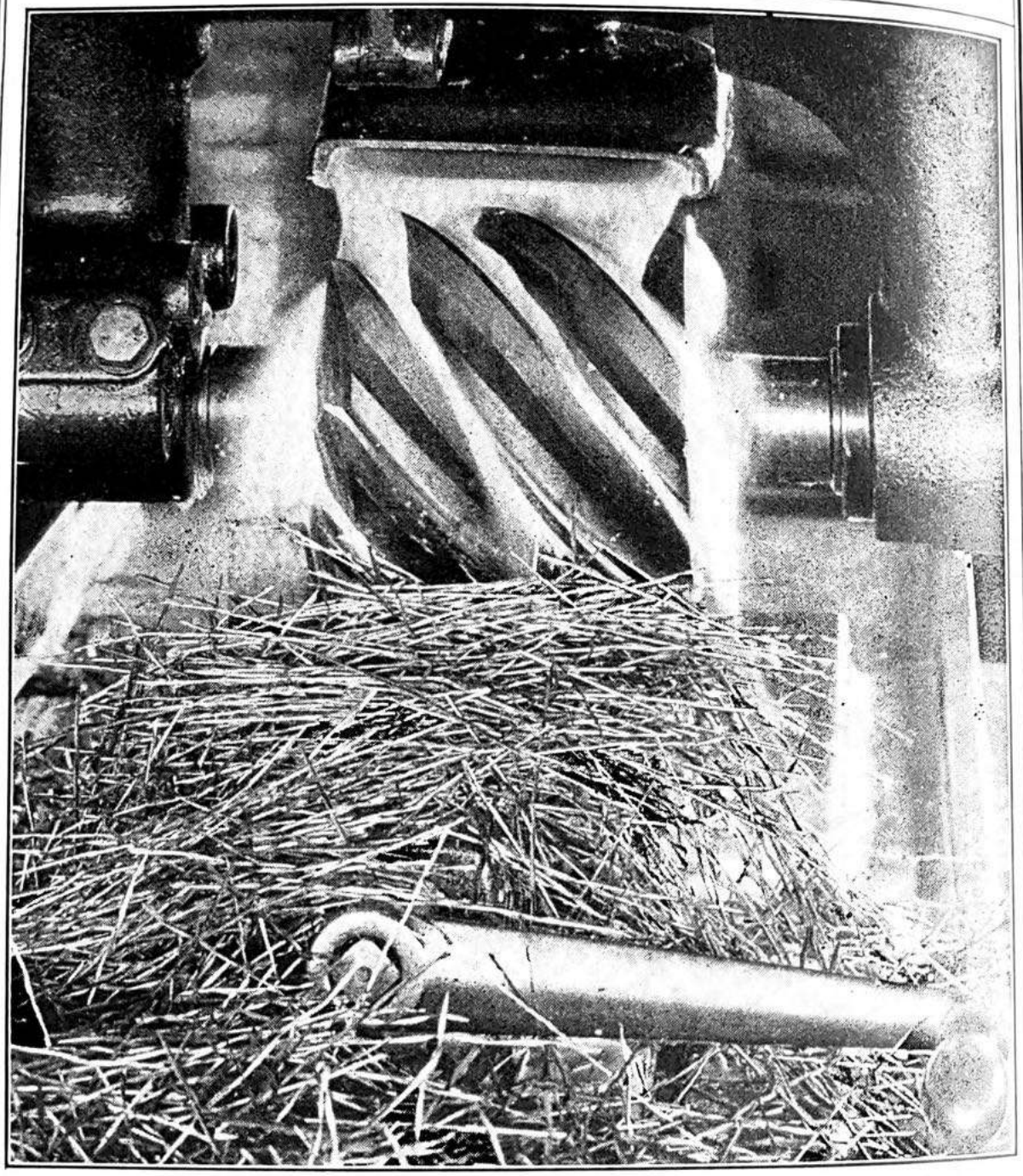
Other sizes made to order. List of Keyways, page 439.

ARBOR TYPE

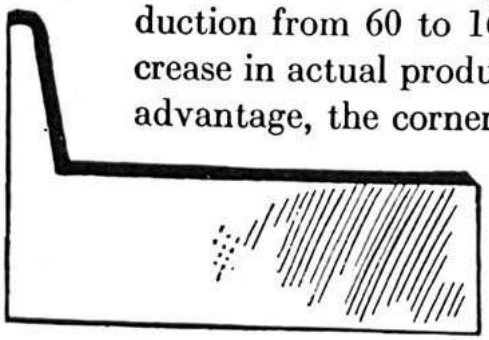


For internal finishing, working either from a drilled hole or directly in from the end of the piece. Illustration shows cutter working directly into the solid metal to form the forked end. The steep spiral gives the mill a shearing action that enables the cut to be taken easily while maintaining a good finish. The undercut teeth contribute to the free cutting action.

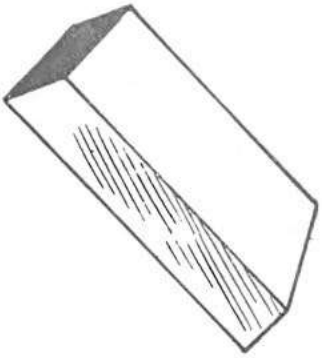
Made to customers' needs in any size and for any method of driving.



The Helical Milling Cutter used on this job increased the production from 60 to 168 pieces per hour. In addition to the increase in actual production, the part was milled to much better advantage, the corners being milled out cleanly, thus eliminating the necessity of a second operation which was required when the previous cutters were used.

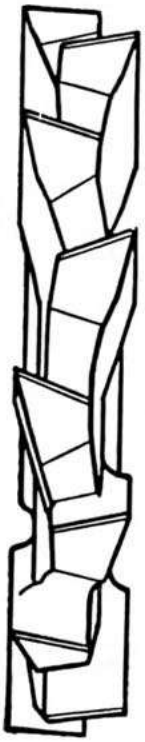


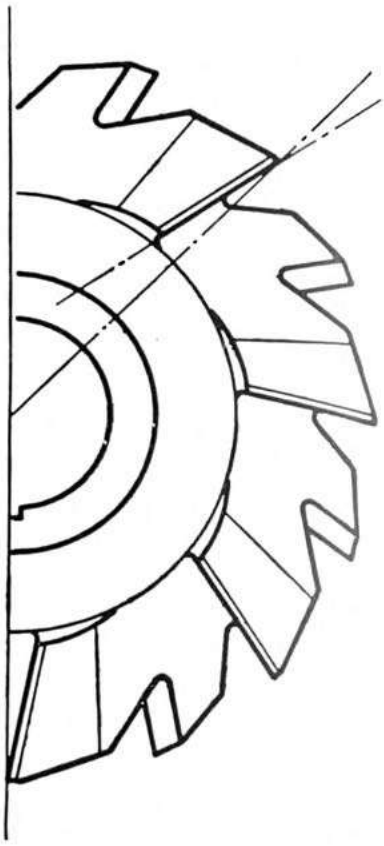
This helical milling cutter effected a 100% gain in production, milling Form Tool Blanks from tool steel. At a feed of 4″, 3¼ cubic inches of metal were removed per minute. The ability of the cutter to take heavy cuts easily was apparent on this job.



Staggered Tooth Side Milling Cutters

HIGH SPEED STEEL





The diagrams above show the structure of the teeth and the undercutting which give an improved shearing action.

Because of the alternate right- and left-hand spiral angles of the teeth, with considerable angle of undercut, these cutters can remove a large amount of metal without destructive vibration and chatter, taking deep cuts with a good finish. The free cutting action makes possible an increased speed and feed—cuts can be taken easily that would stall an ordinary cutter. While intended primarily for deep cuts in steel, Staggered Tooth Cutters will operate on shallow cuts, an advantage if the work requires cuts of varying depths. Held to very close limits, and suitable for cutting standard slots or keyways. Listed with prices on opposite page.

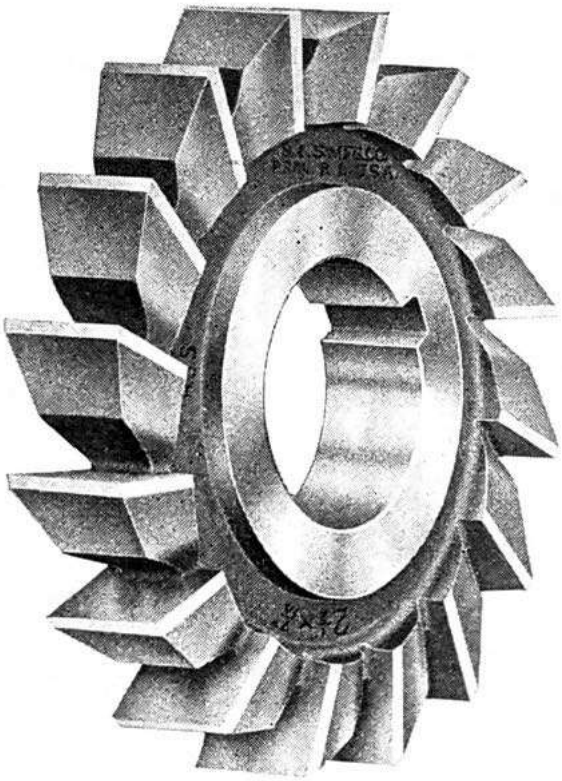
Staggered Tooth Side Milling Cutters

No.	Diameter. Inches	Width of Face, Inches	Hole, Inches	Price, Each, High Speed Steel
M-350	2 1-2	1-4	7-8	$6.80
M-351	2 1-2	5-16	7-8	7.10
M-352	2 1-2	3-8	7-8	7.50
M-353	2 1-2	1-2	7-8	8.30
M-358	3	3-16	1	7.80
M-359	3	1-4	1	8.10
M-360	3	5-16	1	8.60
M-361	3	3-8	1	9.00
M-363	3	1-2	1 1-4	10.00
M-365	3	5-8	1 1-4	10.80
M-367	3	3-4	1 1-4	11.50
M-370	4	1-4	1 1-4	11.30
M-371	4	5-16	1 1-4	12.00
M-372	4	3-8	1 1-4	12.60
M-373	4	7-16	1 1-4	13.40
M-374	4	1-2	1 1-4	14.10
M-376	4	5-8	1 1-4	15.40
M-378	4	3-4	1 1-4	16.60
M-380	4	7-8	1 1-4	17.90
M-382	5	1-2	1 1-4	18.90
M-384	5	5-8	1 1-4	20.90
M-386	5	3-4	1 1-4	22.80
M-390	6	3-8	1 1-4	21.80
M-392	6	1-2	1 1-4	24.60
M-394	6	5-8	1 1-4	27.30
M-396	6	3-4	1 1-4	30.00
M-398	6	7-8	1 1-4	32.80
M-399	6	1	1 1-4	35.50

Other sizes made to order.

List of Keyways, page 489.

Side Milling Cutters



These cutters are often used in pairs for sizing nuts, bolt heads, etc., and are then called "Straddle Milling Cutters." They have cutting edges on both sides of the teeth as well as on the periphery.

No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
S-10	2	3-16	1-2	**$2.10**	$4.20
S-11	2	1-4	1-2	**2.20**	4.40
S-12	2	3-8	1-2	**2.40**	4.80
S-13	2	3-16	5-8	**2.10**	4.20
S-14	2	1-4	5-8	**2.20**	4.40
S-15	2	3-8	5-8	**2.40**	4.80
S-16	2 1-2	1-4	7-8	**2.70**	5.40
S-17	2 1-2	5-16	7-8	**2.90**	5.70
S-18	2 1-2	3-8	7-8	**3.00**	6.00
S-20	2 1-2	1-2	7-8	**3.30**	6.60

List Continued on next page.

Other sizes made to order.

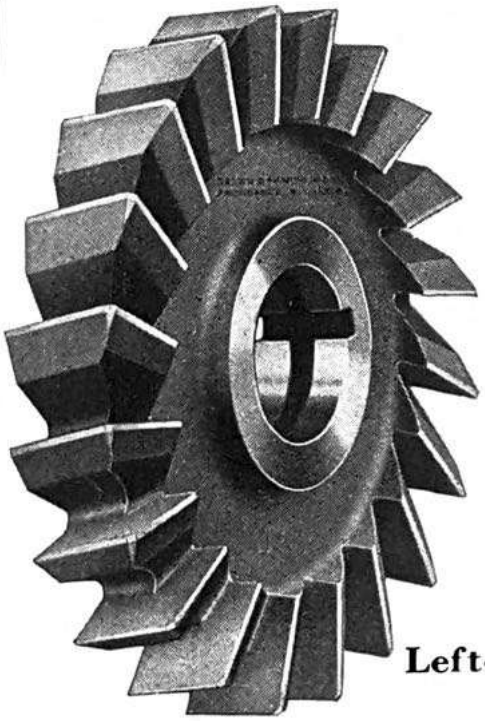
List of Keyways, page 489.

Side Milling Cutters (*Continued*)

No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
S-26	3	1-4	1	$3.30	$6.50
S-27	3	5-16	1	3.50	6.90
S-28	3	3-8	1	3.60	7.20
S-29	3	7-16	1	3.80	7.60
S-30	3	1-2	1	4.00	8.00
S-34A	4	1-4	1	4.50	9.00
S-34B	4	3-8	1	5.10	10.10
S-35	4	1-2	1	5.70	11.30
S-35A	4	1-2	1 1-4	5.70	11.30
S-36	4	5-8	1	6.20	12.30
S-38	4	5-8	1 1-4	6.20	12.30
S-39	4	3-4	1	6.70	13.30
S-39A	4	3-4	1 1-4	6.70	13.30
S-40	4	7-8	1	7.20	14.30
S-40A	4	7-8	1 1-4	7.20	14.30
S-40B	5	1-2	1	7.60	15.10
S-40C	5	1-2	1 1-4	7.60	15.10
S-41	5	3-4	1	9.10	18.20
S-42	5	3-4	1 1-4	9.10	18.20
S-42A	5	5-8	1	8.40	16.70
S-42B	5	5-8	1 1-4	8.40	16.70
S-44A	5	1	1 1-4	10.70	21.30
S-44B	6	1-2	1	9.90	19.70
S-45	6	3-4	1	12.00	24.00
S-45A	6	3-4	1 1-4	12.00	24.00
S-47B	6	1	1 1-4	14.20	28.40
S-47C	7	3-4	1 1-4	17.20	34.40
S-48	7	1	1 1-4	20.20	40.30
S-50	8	1	1 1-4	26.70	53.40

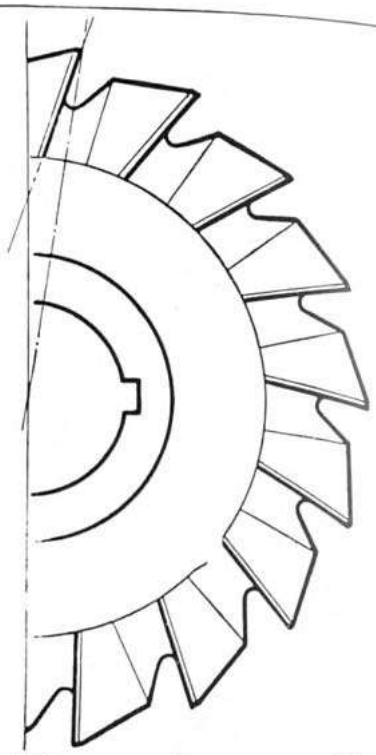
Other sizes made to order.

List of Keyways, page 489.



Half Side Milling Cutters

HIGH SPEED STEEL

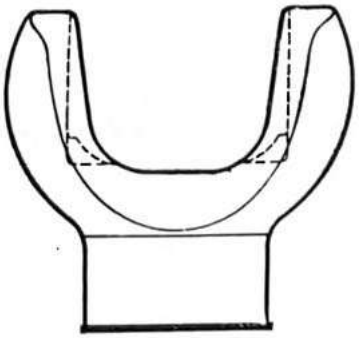


Left-Hand Cutter

These side milling cutters can be used for all side cuts where one side of the cutter only is cutting such as in straddle milling or in cutting slots where complete bottom finish is not required.

Note the spiral on the top and undercut on the side, which go to give the teeth an improved cutting action.

In ordering, state whether Right- or Left-Hand Cutters are wanted.



A pair of half side milling cutters is especially suited for this job, where the width of opening must be maintained and the corner cleaned out but where finishing across the entire bottom is not required.

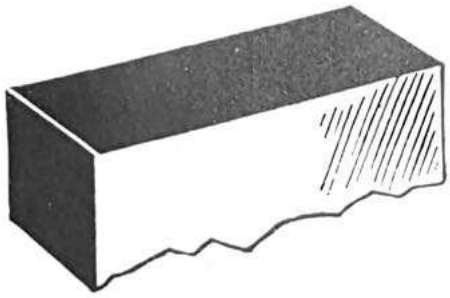
No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each High Speed Steel
S-354	4	3-4	1 1-4	$13.30
S-358	5	3-4	1 1-4	18.20
S-362	6	3-4	1 1-4	24.00
S-366	6	1	1 1-2	28.40
S-370	7	3-4	1 1-2	34.40
S-374	7	1	1 1-2	40.30
S-376	8	1	1 1-2	53.40

Other sizes made to order.

List of Keyways, page 489.

In the above illustration good cutters are "doing their bit" to uphold high production. Cuts 1/4″ deep on top and 1/8″ deep on each side are taken in the milling of this machine part.

With the Brown & Sharpe Cutters selected a practically uninterrupted output is obtained, the cutters easily meeting the gruelling demands of fast production.



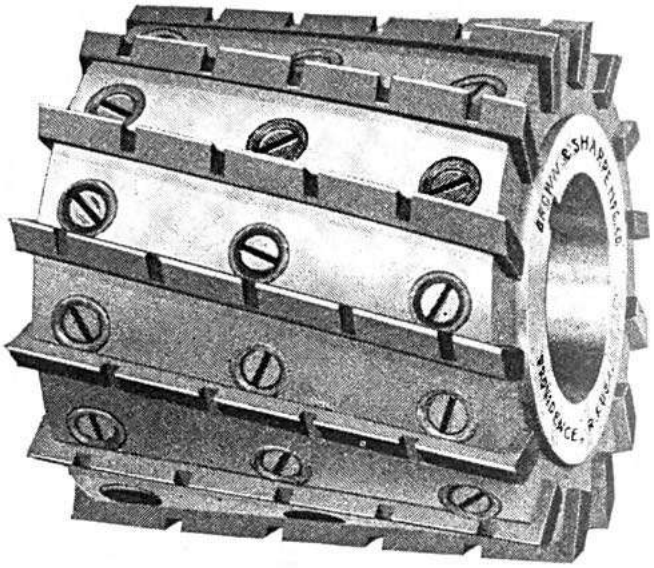
Plain Milling Cutters

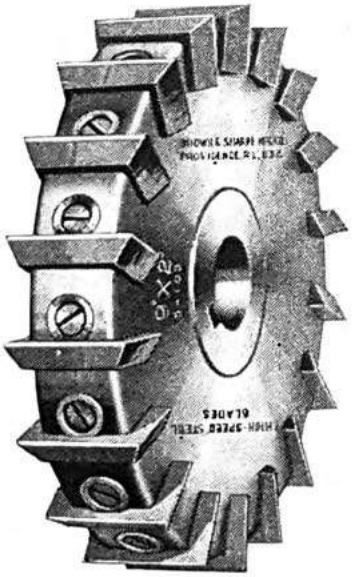
WITH INSERTED TEETH

We recommend that Milling Cutters of more than 8″ diameter be made with inserted teeth. The teeth of the cutters are inserted in the periphery of the machinery steel body, and are regularly furnished of high speed steel, but carbon steel teeth can be furnished, if desired.

Prices upon application.

The bushings, screws and teeth are interchangeable, thus allowing the teeth to be adjusted or removed easily.





Side Milling Cutters

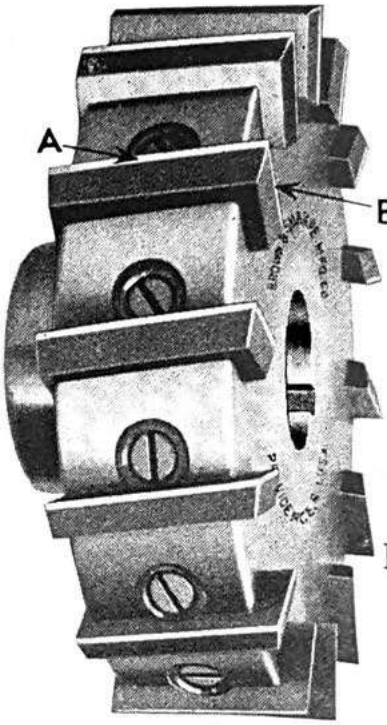
WITH INSERTED TEETH

When Side Milling Cutters of more than 8″ diameter are required, we recommend that they be made with inserted teeth. The cutters have machinery steel bodies and are regularly furnished with teeth of high speed steel, at prices listed below. Prices of cutters with carbon steel teeth on application. The bushings, screws and teeth are interchangeable, thus allowing the teeth to be adjusted or removed easily.

No.	Diameter, Inches	Width of Face, Inches	Hole, Inches	Price, Each, With High Speed Steel Teeth
S-100	6	2	1 1-4	$55.50
S-101	7	2	1 1-4	61.80
S-101A	7	2	1 3-4	61.80
S-102	8	2	1 1-2	69.50
S-102A	8	2	2	69.50
S-103	9	2	1 1-2	77.80
S-104	10	2	1 1-2	86.65

Other sizes made to order. List of Keyways, page 489.

Face Milling Cutters
WITH INSERTED TEETH



Left-Hand Cutter

These Cutters are especially adapted to all classes of face milling.

The body is of machinery steel provided with a taper hole and keyway and is held firmly in place on the arbor by a screw.

Cutters are regularly furnished with teeth of high speed steel. Prices of Cutters with carbon steel teeth on application. The teeth are held in place by taper bushings and screws and can be easily adjusted or removed. The bushings, screws and teeth are interchangeable.

In ordering, state whether Right- or Left-Hand Cutters are wanted

No.	Size, Inches	Face A, Inches	Face B, Inches	No. of Taper Hole	No. of Arbor on which Cutter can be used	Price, Each, With High Speed Steel Teeth
A-1	5 1-2	2 1-4	15-16	10	79 or 80	$64.10
A-2	5 1-2	2 1-4	15-16	12	81, 82, 83, 84, 85 or 87	65.10
A-3	6 1-2	2 1-4	15-16	10	79 or 80	71.10
A-4	6 1-2	2 1-4	15-16	12	81, 82, 83, 84, 85 or 87	72.10
A-6	7 1-2	2 1-4	15-16	12	81, 82, 83, 84, 85 or 87	81.25
A-7	8 1-2	2 1-4	15-16	12	81, 82, 83, 84, 85 or 87	91.15
A-8	9 1-2	2 1-4	15-16	12	81, 82, 83, 84, 85 or 87	101.75

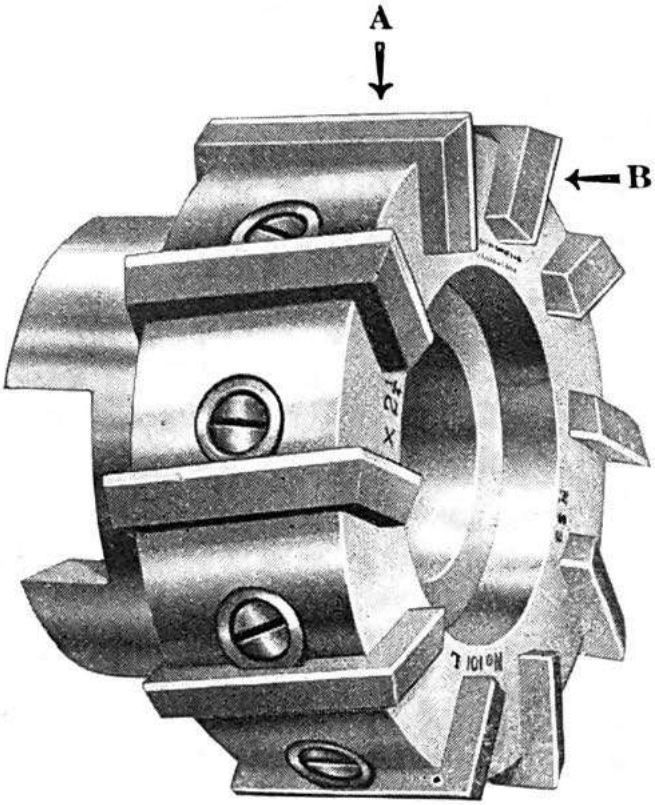
Other sizes made to order.

In ordering teeth, state whether for Right- or Left-Hand Cutters.

List of Arbors, page 541.

Face Milling Cutters

WITH INSERTED TEETH



Left-Hand Cutter

The body is of machinery steel and is regularly furnished with teeth of high speed steel. Prices of cutters with carbon steel teeth on application. The teeth are held in place by taper bushings and screws and can be adjusted or removed easily. The bushings, screws and teeth are interchangeable.

Used in connection with Arbors for Face Milling Cutters No. 50 on page 540 and Nos. 580 and 581 on page 541.

Left-Hand Cutters only are carried in stock.

No.	Diam. of Cutter, Inches	Face A, Inches	Face B, Inches	Machines and Arbors where used	Price, Each, with High Speed Steel Teeth
A-101	5 1-2	2 1-4	15-16	On machines with Standardized Spindle End with Arbor on page 540 and on machines with Taper-Nose Spindle with Arbors on page 541	$65.60
A-103	6 1-2	2 1-4	15-16		72.60
A-106	7 1-2	2 1-4	15-16		81.75

Face Milling Cutters

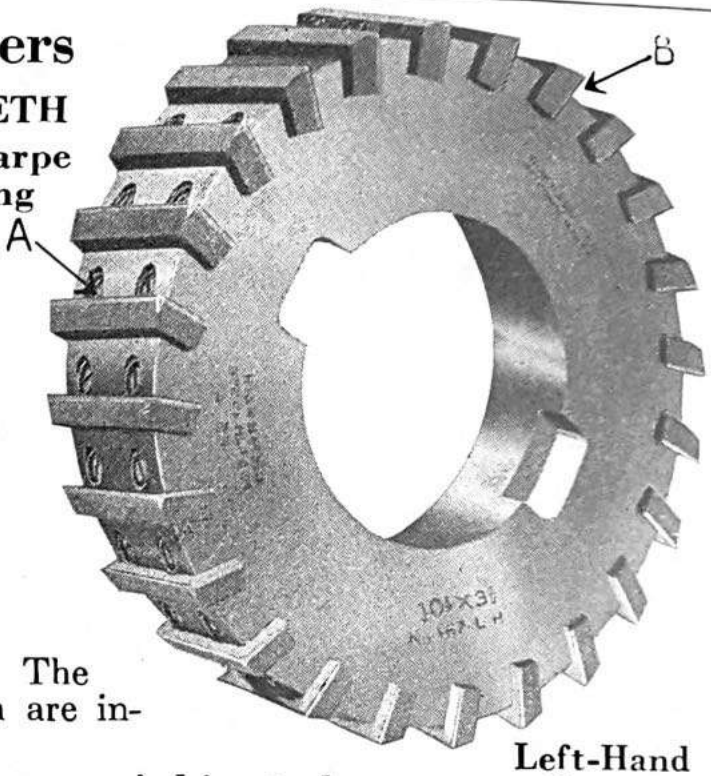
WITH INSERTED TEETH

For use on Brown & Sharpe Milling Machines having Taper-Nose Spindle.

These cutters are fitted directly on nose of spindle without the use of an arbor. The body of the cutter is of machinery steel; the teeth are of high speed steel. Price of carbon steel teeth on application.

The teeth are held in place by taper bushings and screws, and can be easily adjusted or removed. The bushings, screws and teeth are interchangeable.

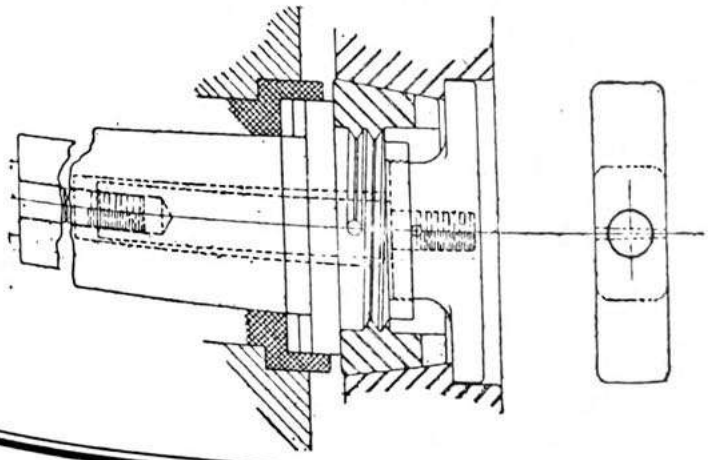
Left-Hand Cutters only are carried in stock.



Left-Hand Cutter

No.	Diam. of Cutter, Inches	Face A, Inches	Face B, Inches	Machines where used	Price, Each, With High Speed Steel Teeth
A-150	6	2 1-4	7-8	*1–*1A–2–2A Univ. M. M.; 1 Hy. Vert. Sp. M. Att.	$80.00
A-151	7	3	15-16		92.65
A-152	8	3	15-16	*1–*1B–2–2B Pl. M. M.; 21 Auto. M. M.	96.00
A-156	9 1-2	3 1-2	15-16	3-3A-3A Hy.-4A-4A Hy. Univ. M.M.; 2-3-5 Vert. Sp.M.M.; 2B Hy.-3-3B-3B Hy.-4B-4B Hy.-5B Hy.-13B Pl.M.M.; 33 Auto. M.M.; 2 Hy.-3-4-5-3 Hy.-4 Hy.-5 Hy. Vert. Sp. M. Att.	129.30
A-157	10 1-2	3 1-2	15-16		141.20
A-158	12	3 1-2	15-16		158.30
A-159	15	3 1-2	15-16		199.40

*With or without Back Gears.



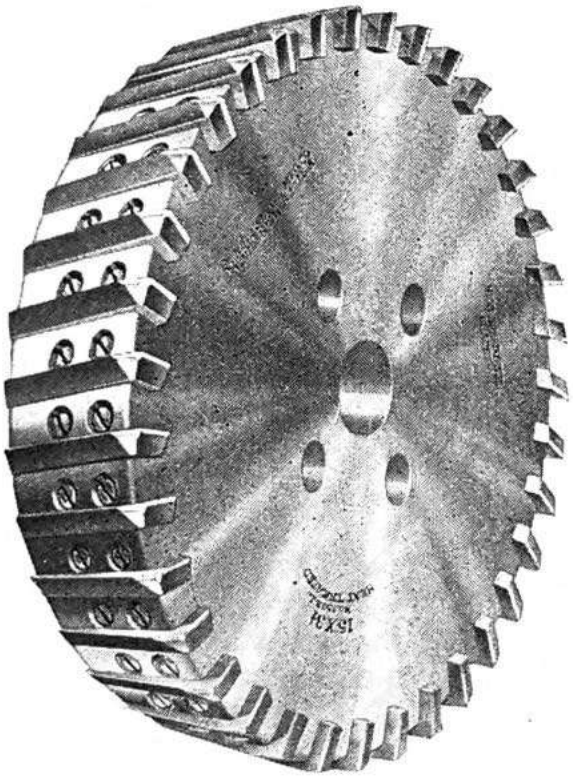
Adapter Outfit

Permits cutters with taper holes to be used on threaded-nose spindle. It consists of taper sleeve with threaded hole, driver and draw-in bolt.

When ordering, give size and serial number of machine. Price on application.

Face Milling Cutters

WITH INSERTED TEETH



Left-Hand Cutter

For use on Milling Machines having Standardized Spindle End

The body of this cutter is of heat treated alloy steel; the teeth are of high speed steel. Price of cutter with carbon steel teeth on application.

The teeth are held in place by taper bushings and screws, and can be adjusted or removed easily. The bushings, screws and teeth are interchangeable.

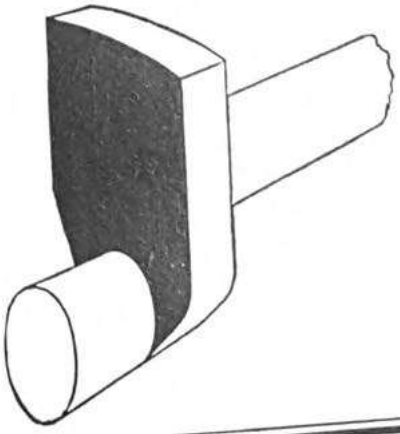
Cutter is centered on outside diameter of spindle and is secured in place by four holding screws. It is positively driven by keys on end of spindle.

In ordering, state whether Right- or Left-Hand Cutters are wanted. Always state whether holding screws or wrenches for attaching cutters are required. Prices upon application.

No.	Diam. of Cutter, Inches	Face (Side), Inches	Diam. of Ground Recess, Inches	Price, Each, with High Speed Steel Teeth
*A-252	8	3	5.062	$80.00
A-256	9	3	5.062	89.75
A-257	10	3	5.062	99.80
A-258	12	3	5.062	118.75
A-259	15	3	5.062	150.50

*Differs from description in that teeth are held in place in body by pins.

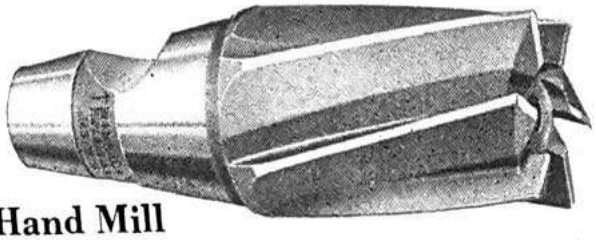
A Brown & Sharpe Inserted Tooth Cutter is here rough facing the end of this chrome nickel steel crankshaft. Because of the draft on the forging, nearly ½″ of stock is removed at the widest part of the cut, so that to produce to the best advantage the operator changes the feed as the work progresses.

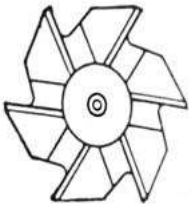


Spiral End Mills

Milling Machine Standard Taper Shank

HIGH SPEED STEEL





Left-Hand Mill

For use with Cutter Adapters with Cam Lock, See Page 532.

Left-Hand End Mills have Left-Hand Spiral.
Right-Hand End Mills have Right-Hand Spiral.

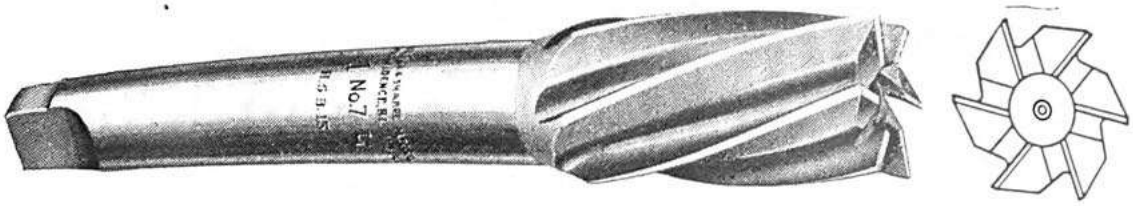
In ordering, state whether Right- or Left-Hand Mills are wanted.

No.	Diameter, Inches	For use with Adapters having M.M. Standard Taper Hole, No.	Length of Cut, Inches	Whole Length, Inches	Price, Each, High Speed Steel
E-1002	1-4	10	5-8	2	$3.90
E-1004	3-8	10	3-4	2 1-8	4.20
E-1006	1-2	10	15-16	2 5-16	4.50
E-1008	5-8	10	1 1-8	2 1-2	4.50
E-2002	1-2	20	15-16	2 7-8	5.00
E-2004	5-8	20	1 1-8	3 1-16	5.40
E-2006	3-4	20	1 1-4	3 3-16	5.40
E-2008	7-8	20	1 7-16	3 3-8	5.60
E-2010	1	20	1 5-8	3 9-16	6.50
E-2012	1 1-8	20	1 3-4	3 11-16	7.30
E-2014	1 1-4	20	2	3 15-16	8.40
E-3000	3-4	30	1 1-4	3 3-4	8.00
E-3001	7-8	30	1 7-16	3 15-16	8.40
E-3002	1	30	1 5-8	4 1-8	8.80
E-3004	1 1-8	30	1 3-4	4 1-4	8.80
E-3006	1 1-4	30	2	4 1-2	9.00
E-3008	1 3-8	30	2 1-8	4 5-8	10.40
E-3010	1 1-2	30	2 1-4	4 3-4	11.50
E-3012	1 5-8	30	2 3-8	4 7-8	13.30
E-3014	1 3-4	30	2 1-2	5	14.40

Other sizes made to order.
Milling Machine Standard Tapers, page 656.
Adapters, pages 546 to 548.

Spiral End Mills

Brown & Sharpe Taper Shank



Left-Hand Mill

End Mills with No. 5 Taper Shanks have Plain Ends, not Tang End shown.

Left-Hand End Mills have Left-Hand Spiral.
Right-Hand End Mills have Right-Hand Spiral.
In ordering, state whether Right- or Left-Hand Mills are wanted.

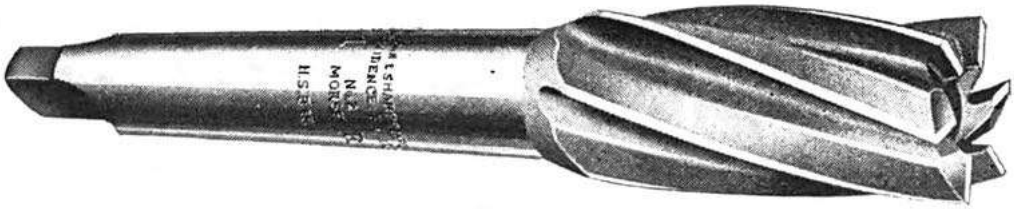
No.	Diameter, Inches	No. of Taper Shank	Length of Cut, Inches	Whole Length, Inches	Price, Each	
					Carbon Steel	High Speed Steel
E-101	1-4	5	5-8	2 13-16	$1.70	$3.30
E-103	5-16	5	11-16	2 7-8	1.70	3.30
E-105	3-8	5	3-4	2 15-16	1.70	3.30
E-107	7-16	5	7-8	3 1-16	1.80	3.50
E-108	1-2	5	15-16	3 1-8	1.80	3.50
E-109	1-2	7	15-16	4 15-16	2.60	5.10
E-111	9-16	7	1	5	2.60	5.10
E-113	5-8	7	1 1-8	5 1-8	2.70	5.30
E-116	3-4	7	1 1-4	5 1-4	2.70	5.30
E-120	7-8	7	1 7-16	5 7-16	3.10	6.10
E-124	1	7	1 5-8	5 5-8	3.50	7.00
E-129	1 1-8	9	1 3-4	7	4.70	9.30
E-133	1 1-4	9	2	7 1-4	5.30	10.50
E-137	1 1-2	9	2 1-4	7 1-2	6.70	13.30
E-139	1 3-4	9	2 1-2	7 3-4	8.30	16.60

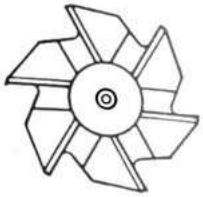
Other sizes made to order.

Brown & Sharpe Tapers, pages 654 to 656.
Adapters and Collets, pages 543, 548, 550 and 551.

Spiral End Mills

Morse Taper Shank





Right-Hand Mill

Right-Hand End Mills have Right-Hand Spiral.
Left-Hand End Mills have Left-Hand Spiral.

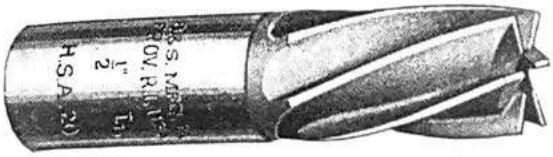
Right-hand mills only are carried in stock. Left-hand mills made to order. Price on application.

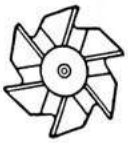
No.	Diameter, Inches	No. of Taper Shank	Length of Cut, Inches	Whole Length, Inches	Price, Each	
					Carbon Steel	High Speed Steel
E-395	1-4	1	5-8	3 1-2	$1.60	$3.20
E-396	5-16	1	11-16	3 9-16	1.70	3.30
E-397	3-8	1	3-4	3 5-8	1.70	3.30
E-398	7-16	1	7-8	3 3-4	1.70	3.30
E-400	1-2	1	15-16	3 13-16	1.70	3.40
E-401	1-2	2	15-16	4 7-16	2.40	4.80
E-404	5-8	2	1 1-8	4 5-8	2.50	4.90
E-406	3-4	2	1 1-4	4 3-4	2.50	4.90
E-407	3-4	3	1 1-4	5 9-16	3.50	7.00
E-410	7-8	2	1 7-16	4 15-16	2.90	5.70
E-411	7-8	3	1 7-16	5 3-4	3.50	7.00
E-414	1	2	1 5-8	5 1-8	3.30	6.60
E-415	1	3	1 5-8	5 15-16	3.70	7.30
E-418	1 1-8	3	1 3-4	6 1-16	4.20	8.40
E-420	1 1-4	3	2	6 5-16	4.80	9.60

Other sizes made to order.
Morse Tapers, page 657.
Adapters, page 543.

End Mills

Straight Shank





Left-Hand Mill

Mills less than ¼″ diameter have straight teeth and mills ¼″ and over have spiral teeth.

Left-Hand End Mills have Left-Hand Spiral.
Right-Hand End Mills have Right-Hand Spiral.

In ordering, state whether Right- or Left-Hand Mills are wanted.

No.	*Diameter, Inches	Length of Cut, Inches	Whole Length, Inches	Price, Each	
				Carbon Steel	High Speed Steel
E-650	1-8	5-16	1 1-4	$0.70	$1.40
E-651	5-32	5-16	1 1-4	.80	1.50
E-652	3-16	1-2	1 3-8	.90	1.70
E-653	7-32	9-16	1 5-8	.90	1.80
E-654	1-4	5-8	1 11-16	.90	1.80
E-656	5-16	11-16	1 3-4	1.00	1.90
E-658	3-8	3-4	1 13-16	1.10	2.10
E-660	7-16	7-8	2 3-16	1.20	2.30
E-661	1-2	15-16	2 1-4	1.30	2.50
E-662	9-16	1	2 5-16	1.40	2.70
E-663	5-8	1 1-8	2 1-2	1.50	3.00
E-665	3-4	1 1-4	2 5-8	1.80	3.50

*Shank is same diameter as cut taken.

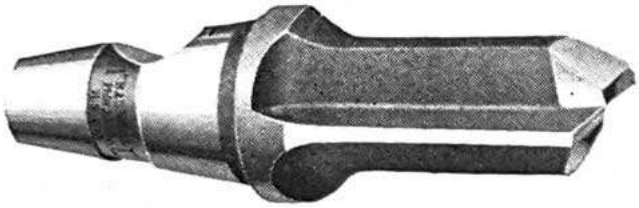
Other sizes made to order.

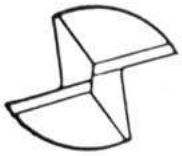
Adapters, Collets and Chucks, pages 549 and 552 to 554.

Two Lipped End Mills

Milling Machine Standard Taper Shank

HIGH SPEED STEEL





Left-Hand Mill

For use with Cutter Adapters with Cam Lock. **See Page 532.**

The "Two Lipped" type of end mill is especially suited for rapid milling in solid metal. The design permits sinking directly into the metal and eliminates the necessity of drilling. A depth of cut equal to one-half the diameter of the mill can usually be taken from solid stock. A high surface speed is necessary to secure the best results.

In ordering, state whether Right- or Left-Hand Mills are wanted.

No.	Diameter, Inches	For use with Adapters having M.M. Standard Taper Hole, No.	Length of Cut, Inches	Whole Length, Inches	Price, Each, High Speed Steel
E-1050	1-4	10	3-8	1 21-32	$4.10
E-1051	5-16	10	15-32	1 3-4	4.10
E-1052	3-8	10	9-16	1 27-32	4.30
E-1053	7-16	10	21-32	1 15-16	4.30
E-1054	1-2	10	3-4	2 1-32	4.60
E-1055	9-16	10	27-32	2 1-8	4.60
E-1056	5-8	10	15-16	2 7-32	4.60
E-2050	1-2	20	3-4	2 7-16	5.00
E-2051	9-16	20	27-32	2 17-32	5.30
E-2052	5-8	20	15-16	2 5-8	5.30
E-2053	11-16	20	1 1-32	2 23-32	5.30
E-2054	3-4	20	1 1-8	2 13-16	5.50
E-2055	13-16	20	1 7-32	2 29-32	5.50
E-2056	7-8	20	1 5-16	3	5.50
E-2058	1	20	1 1-2	3 3-16	6.50
E-2060	1 1-8	20	1 11-16	3 3-8	7.60
E-2062	1 1-4	20	1 7-8	3 9-16	8.80
E-3048	3-4	30	1 1-8	3 3-8	8.40
E-3049	7-8	30	1 5-16	3 9-16	8.80
E-3050	1	30	1 1-2	3 3-4	8.80
E-3052	1 1-8	30	1 11-16	3 15-16	9.20
E-3054	1 1-4	30	1 7-8	4 1-8	9.70
E-3058	1 1-2	30	2 1-4	4 1-2	12.20

Other sizes made to order.

Milling Machine Std. Tapers, page 656. Adapters, pages 546 to 548.

Two Lipped End Mills

Brown & Sharpe Taper Shank

HIGH SPEED STEEL

Right-Hand Mill

The "Two Lipped" type of end mill is especially suited for rapid milling in solid metal. The design permits sinking directly into the metal and eliminates the necessity of drilling. A depth of cut equal to one-half the diameter of the mill can usually be taken from solid stock. A high surface speed is necessary to secure the best results.

End Mills with No. 5 Taper Shanks have Plain Ends, not Tang End shown.

In ordering, state whether Right- or Left-Hand Mills are wanted.

No.	Diameter, Inches	No. of Taper Shank	Length of Cut, Inches	Whole Length, Inches	Price, Each. High Speed Steel
E-598	1-4	5	3-8	2 9-16	$3.40
E-599	5-16	5	15-32	2 21-32	3.40
E-600	1-4	7	3-8	4 3-8	5.30
E-601	5-16	7	15-32	4 15-32	5.30
E-602	3-8	7	9-16	4 9-16	5.40
E-603	7-16	7	21-32	4 21-32	5.40
E-604	1-2	7.	3-4	4 3-4	5.40
E-606	5-8	7	15-16	4 15-16	5.60
E-608	3-4	7	1 1-8	5 1-8	5.80
E-612	7-8	7	1 5-16	5 5-16	6.70
E-615	1	9	1 1-2	6 3-4	9.90
E-619	1 1-4	9	1 7-8	7 1-8	11.60
E-623	1 1-2	9	2 1-4	7 1-2	14.60

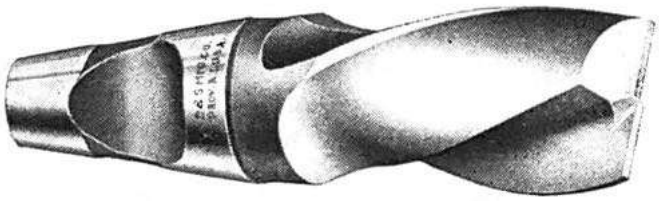
Other sizes made to order.

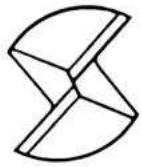
Brown & Sharpe Tapers, pages 654 to 656.
Adapters and Collets, pages 543, 548, 550 and 551.

Spiral Two Lipped End Mills

Milling Machine Standard Taper Shank

HIGH SPEED STEEL





Left-Hand Mill

For use with Cutter Adapters with Cam Lock. See Page 532.

The "Two Lipped" type of end mill is especially suited for rapid milling in solid metal. The design permits sinking directly into the metal and eliminates the necessity of drilling. A depth of cut equal to one-half the diameter of the mill can usually be taken from solid stock. A high surface speed is necessary to secure the best results.

Left-Hand End Mills have Left-Hand Spiral.

Right-Hand End Mills have Right-Hand Spiral.

In ordering state whether Right- or Left-Hand Mills are wanted.

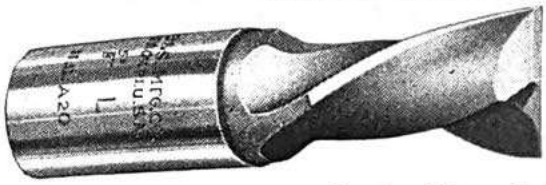
No.	Diameter, Inches	For use with Adapters having M.M. Standard Taper Hole, No.	Length of Cut, Inches	Whole Length, Inches	Price, Each, High Speed Steel
E-1075	1-4	10	3-8	1 3-4	$4.10
E-1076	5-16	10	15-32	1 27-32	4.30
E-1077	3-8	10	9-16	1 15-16	4.30
E-1078	7-16	10	21-32	2 1-32	4.60
E-1079	1-2	10	3-4	2 1-8	4.60
E-1081	5-8	10	15-16	2 5-16	5.00
E-2075	1-2	20	3-4	2 11-16	5.30
E-2077	5-8	20	15-16	2 7-8	5.50
E-2079	3-4	20	1 1-8	3 1-16	5.90
E-2081	7-8	20	1 5-16	3 1-4	5.90
E-2083	1	20	1 1-2	3 7-16	6.70
E-3075	1	30	1 1-2	4	7.50
E-3077	1 1-4	30	1 7-8	4 3-8	9.90
E-3079	1 1-2	30	2 1-4	4 3-4	12.70

Milling Machine Standard Tapers, page 656.
Adapters, pages 546 to 548.

Spiral Two Lipped End Mills

Straight Shank

HIGH SPEED STEEL



Left-Hand Mill

The "Two Lipped" type of end mill is especially suited for rapid milling in solid metal. The design permits sinking directly into the metal and eliminates the necessity of drilling. A depth of cut equal to one-half the diameter of the mill can usually be taken from solid stock. A high surface speed is necessary to secure the best results.

Left-Hand End Mills have Left-Hand Spiral.

Right-Hand End Mills have Right-Hand Spiral.

In ordering, state whether Right- or Left-Hand Mills are wanted.

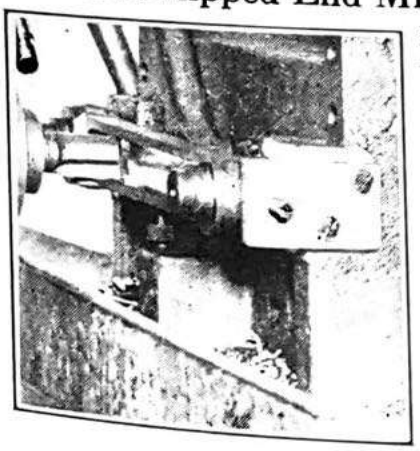
No.	*Diameter, Inches	Length of Cut, Inches	Whole Length, Inches	Price, Each, High Speed Steel
E-675	1-4	3-8	1 7-16	$1.90
E-676	5-16	15-32	1 9-16	2.10
E-677	3-8	9-16	1 5-8	2.20
E-678	7-16	21-32	2	2.40
E-679	1-2	3-4	2 1-16	2.80
E-681	5-8	15-16	2 5-16	3.30
E-683	3-4	1 1-8	2 1-2	3.60

*Shank is same diameter as cut taken.

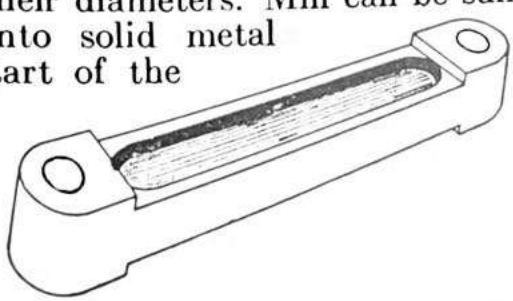
Other sizes made to order.

Adapters, Collets and Chucks, pages 549 and 552 to 554.

This Two Lipped End Mill is taking a rapid roughing cut in a special alloy steel forging 8″ long with a cutting time of 350 seconds (approx.).



The free cutting action of the widely spaced side teeth makes fast feeds possible, and the mills can maintain a width of slot equal to their diameters. Mill can be sunk directly into solid metal for the start of the cut.



Woodruff Key Seat Cutters

Right-Hand Cutters only are carried in stock. Left-Hand Cutters made to order. Price on application.

Right-Hand Cutter

All Cutters listed have shank 1-2″ in diameter.

No.		Diameter, Inches	Thickness, Inches	Whole Length, Inches	Price, Each	
American Standard	Old Standard				Carbon Steel	High Speed Steel
...	201	1-4	1-16	2 1-16	$1.80	$3.50
...	206	5-16	1-16	2 1-16	1.80	3.50
...	207	5-16	3-32	2 3-32	1.80	3.50
...	211	3-8	1-16	2 1-16	1.80	3.50
...	212	3-8	3-32	2 3-32	1.80	3.50
...	213	3-8	1-8	2 1-8	1.80	3.50
204	1	1-2	1-16	2 1-16	1.40	2.80
304	2	1-2	3-32	2 3-32	1.40	2.80
305	4	5-8	3-32	2 3-32	1.40	2.80
404	3	1-2	1-8	2 1-8	1.40	2.80
405	5	5-8	1-8	2 1-8	1.40	2.80
406	7	3-4	1-8	2 1-8	1.60	3.10
505	6	5-8	5-32	2 5-32	1.40	2.80
...	61	5-8	3-16	2 3-16	1.40	2.80
506	8	3-4	5-32	2 5-32	1.60	3.10
...	91	3-4	1-4	2 1-4	1.60	3.10
507	10	7-8	5-32	2 5-32	1.70	3.40
606	9	3-4	3-16	2 3-16	1.60	3.10
607	11	7-8	3-16	2 3-16	1.70	3.40
...	12	7-8	7-32	2 7-32	1.70	3.40
608	13	1	3-16	2 3-16	1.90	3.80
...	14	1	7-32	2 7-32	1.90	3.80
...	152	1	3-8	2 3-8	2.10	4.20
609	16	1 1-8	3-16	2 3-16	2.10	4.20
807	A	7-8	1-4	2 1-4	1.70	3.40
808	15	1	1-4	2 1-4	1.90	3.80
...	17	1 1-8	7-32	2 7-32	2.10	4.20
809	18	1 1-8	1-4	2 1-4	2.10	4.20
...	19	1 1-4	3-16	2 3-16	2.30	4.60
...	20	1 1-4	7-32	2 7-32	2.30	4.60
810	21	1 1-4	1-4	2 1-4	2.30	4.60
811	22	1 3-8	1-4	2 1-4	2.50	5.00
812	24	1 1-2	1-4	2 1-4	2.80	5.50

List continued on next page.

Adapters, Collets and Chucks, pages 549 and 552 to 554.

Woodruff Key Seat Cutters (*Continued*)

No. American Standard	No. Old Standard	Diameter, Inches	Thickness, Inches	Whole Length, Inches	Price, Each Carbon Steel	Price, Each High Speed Steel
1008	B	1	5-16	2 5-16	**$2.00**	**$4.00**
1009	C	1 1-8	5-16	2 5-16	**2.20**	**4.40**
1010	D	1 1-4	5-16	2 5-16	**2.50**	**4.90**
1011	23	1 3-8	5-16	2 5-16	**2.70**	**5.40**
1012	25	1 1-2	5-16	2 5-16	**3.00**	**5.90**
1210	E	1 1-4	3-8	2 3-8	**2.50**	**4.90**
1211	F	1 3-8	3-8	2 3-8	**2.70**	**5.40**
1212	G	1 1-2	3-8	2 3-8	**3.00**	**5.90**

Adapters, Collets and Chucks, pages 549 and 552 to 554.

Woodruff Key Seat Cutters, Arbor Type, can be furnished for the following Keys. Price on application.

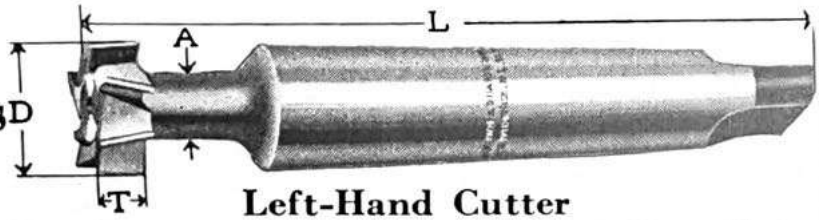
Cutter No.	26	27	28	29	R	S	T	U	V
Key No.	126	127	128	129	RX	SX	TX	UX	VX

Cutter No.	30	31	32	33	34	35	36
Key No.	30	31	32	33	34	35	36

List of Keyways, page 489.

Standard T Slot Cutters

Brown & Sharpe Taper Shank



Left-Hand Cutter

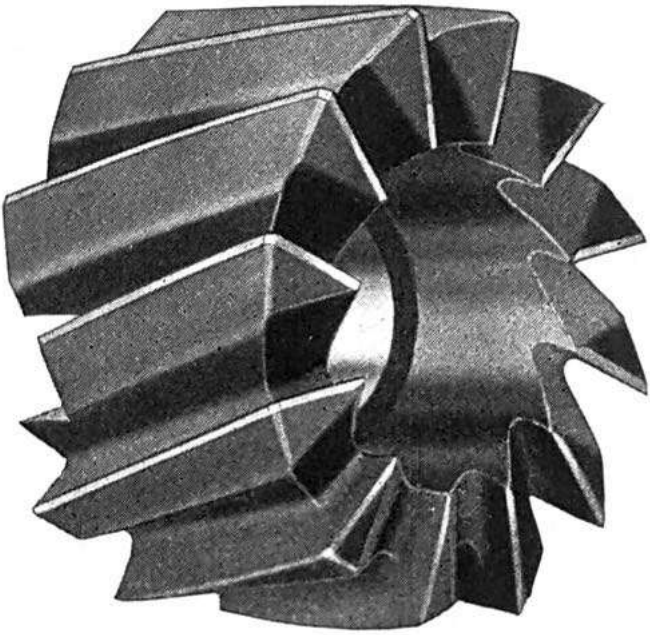
Cutters with No. 5 Taper Shanks have Plain Ends, not Tang End shown. **State whether Right- or Left-Hand Cutters are wanted.**

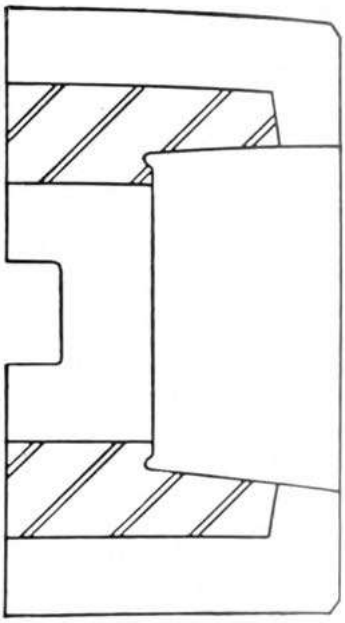
No.	Bolt Size, Inches	Dia. of Cutter, D, Inches	Thickness of Cutter, T, Inches	Dia. of Neck, A, Inches	No. of Taper Shank	Whole Length, L, Inches	Price, Each Carbon Steel	Price, Each High Speed Steel
1	1-4	9-16	15-64	17-64	5	2 5-8	On Application	On Application
2	5-16	21-32	17-64	21-64	5	2 23-32		
3	3-8	25-32	21-64	13-32	7	4 13-16		
4	1-2	31-32	25-64	17-32	7	5		
5	5-8	1 1-4	31-64	21-32	7	5 1-4		
6	3-4	1 15-32	5-8	25-32	9	6 7-8		
7	1	1 27-32	53-64	1 1-32	9	7 1-4		
8	1 1-4	2 7-32	1 3-32	1 9-32	9	7 13-16		
9	1 1-2	2 21-32	1 11-32	1 17-32	10	10 3-8		

Other sizes made to order. Brown & Sharpe Tapers, pages 654 to 656.
Adapters and Collets, pages 543, 548, 550 and 551.

Shell End Mills

HIGH SPEED STEEL





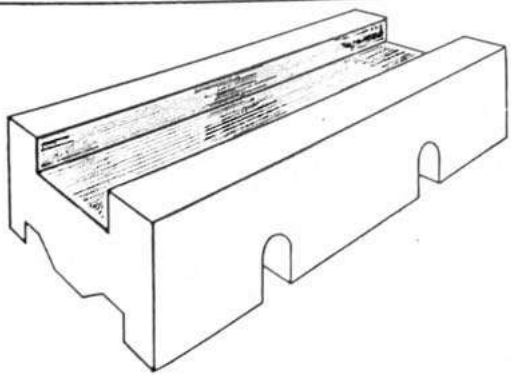
Left-Hand Mill

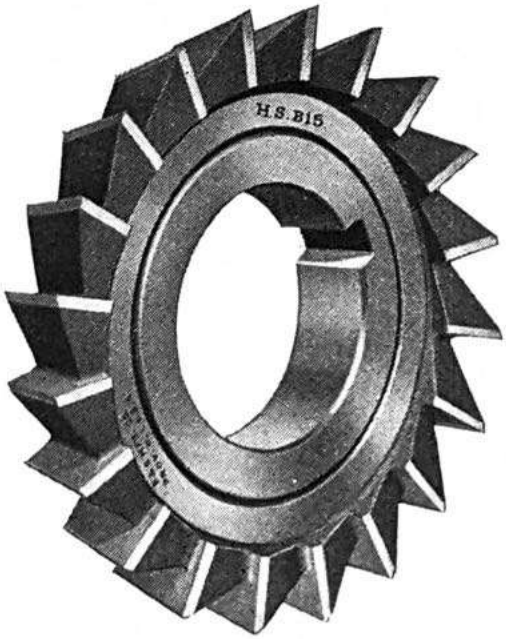
For use with Arbors for Shell End Mills, listed on pages 537 and 538.

Left-Hand End Mills have Left-Hand Spiral.
Right-Hand End Mills have Right-Hand Spiral.
In ordering, state whether Right- or Left-Hand Mills are wanted.

No.	Diam., Inches	Length of Cut, Inches	Hole, Inches	Price, Each, High Speed Steel
F-225	1 1-4	1	1-2	$5.40
F-226	1 1-2	1 1-8	1-2	6.00
F-227	1 3-4	1 1-4	3-4	6.70
F-228	2	1 3-8	3-4	7.70
F-229	2 1-4	1 1-2	1	9.00
F-230	2 1-2	1 5-8	1	10.70
F-231	2 3-4	1 5-8	1	12.10
F-232	3	1 3-4	1 1-4	14.20
F-233	3 1-2	1 7-8	1 1-4	19.20
F-234	4	2 1-4	1 1-2	25.50
F-235	4 1-2	2 1-4	1 1-2	30.80
F-236	5	2 1-4	1 1-2	36.70
F-237	5 1-2	2 1-4	2	42.10
F-238	6	2 1-4	2	50.20

Typical of many jobs where Brown & Sharpe Shell End Mills can be used for the most economical operation. The Shell End Mill keeps alignment of top surface with groove and produces flat surface within .0025″ ready for scraping. Ten cuts $4\frac{7}{16}''$ x 12″ x $\frac{7}{8}''$ are finished per hour.





Left-Hand Cutter

Angular Cutters

Made with 45° or 60° included angle, either right- or left-hand.

In ordering, state whether Right- or Left-Hand Cutters are wanted.

No.	Diameter, Inches	Thickness, Inches	Hole, Inches	Price, Each,	
				Carbon Steel	High Speed Steel
J-10	2 1-2	1-2	7-8	**$3.30**	$6.60
J-11	2 3-4	1-2	1	**3.60**	7.20
J-12	3	1-2	1 1-4	**4.00**	8.00

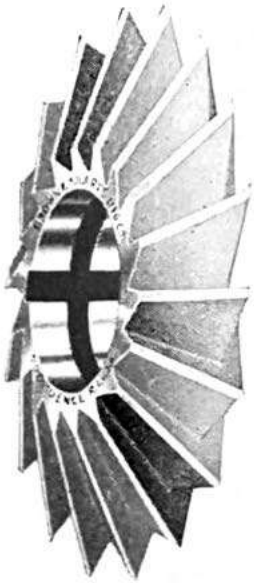
Other sizes made to order.

Double Angle Cutters

Made with 45°, 60°, or 90° included angle.

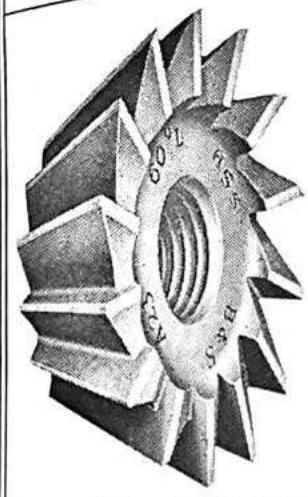
No.	Diam., Inches	Thickness, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
J-101	2 3-4	1-2	1	**$3.60**	**$7.20**

V-shaped cutters of any angle made to order.



List of Keyways, page 489.

Angular Cutters with Threaded Holes



Left-Hand Cutter

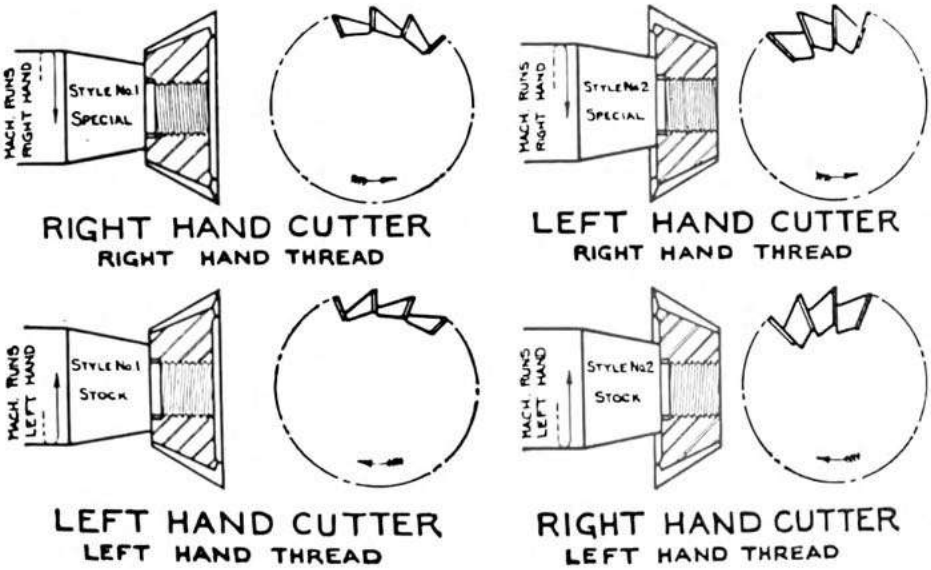
Made with 60° included angle, either right- or left-hand.

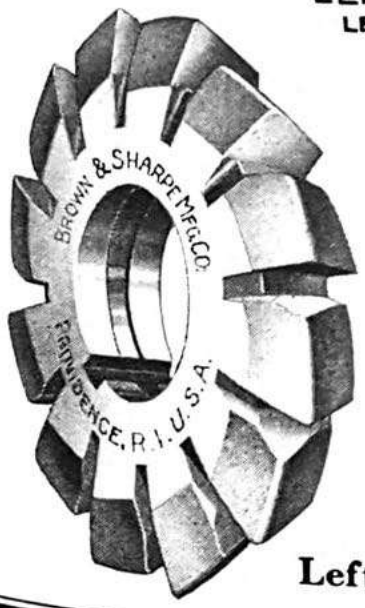
In ordering, state whether Right- or Left-Hand Cutters are wanted.

No.	Diam., Inches	Thickness, Inches	Threaded Hole	Price, Each	
				Carbon Steel	High Speed Steel
J-35	1 1-4	7-16	3-8″ 24 N.F., L.H.	$2.70	$5.40
J-36	1 5-8	9-16	1-2″ 20 N.F., L.H.	3.10	6.10

Other sizes made to order. List of Arbors, page 542.

Determining the Hand of an Angular Cutter.





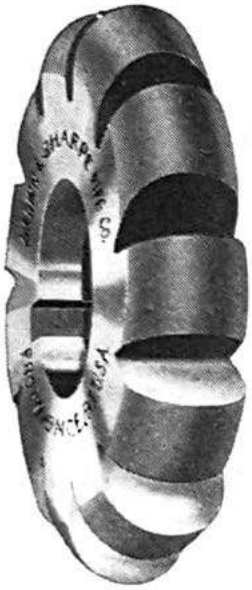
Left-Hand Cutter

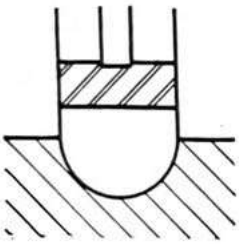
Angular Cutters and Cutters for Spiral Mills

WITH BACKED-OFF TEETH

Can be sharpened by grinding without changing their form. Made to order.

List of Keyways, page 489.



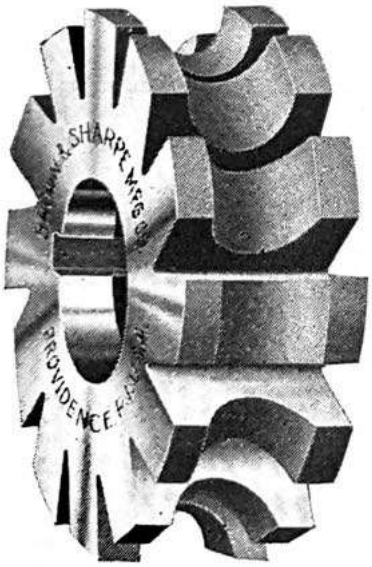


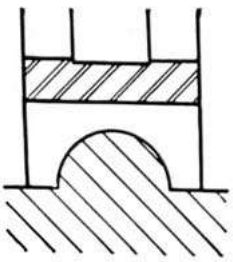
Convex Cutters

For Milling Half Circles

These cutters can be sharpened by grinding without changing their outline.

No.	Diam. of Circle, Inches	Diam. of Cutter, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
C-10	1-8	2	7-8	$3.00	$6.00
C-11	3-16	2	7-8	3.00	6.00
C-12	1-4	2	7-8	3.10	6.20
C-13	5-16	2 1-4	7-8	3.60	7.20
C-14	3-8	2 1-4	7-8	3.80	7.50
C-15	7-16	2 1-4	7-8	3.90	7.80
C-16	1-2	2 1-4	7-8	4.10	8.10
C-17	5-8	2 3-4	1	5.20	10.40
C-18	3-4	3	1	6.00	12.00
C-19	7-8	3 1-4	1	7.00	13.90
C-20	1	3 1-4	1	7.30	14.60





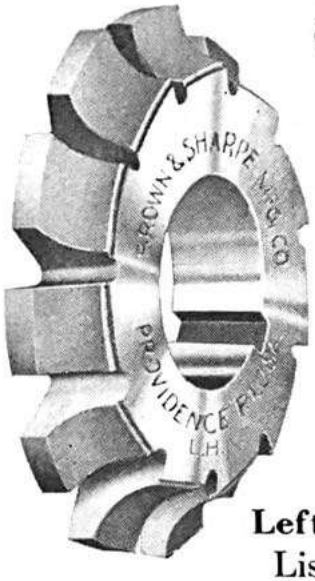
Concave Cutters

For Milling Half Circles

These cutters can be sharpened by grinding without changing their outline.

No.	Diam. of Circle, Inches	Diam. of Cutter, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
D-10	1-8	2	7-8	$3.10	$6.20
D-11	3-16	2	7-8	3.40	6.80
D-12	1-4	2	7-8	3.50	7.00
D-13	5-16	2 1-4	7-8	4.30	8.50
D-14	3-8	2 1-4	7-8	4.30	8.50
D-15	7-16	2 1-4	7-8	4.50	9.00
D-16	1-2	2 1-4	7-8	4.80	9.50
D-17	5-8	2 3-4	1	6.10	12.10
D-18	3-4	3	1	7.40	14.70
D-19	7-8	3 1-4	1	8.50	16.90
D-20	1	3 1-4	1	9.20	18.40

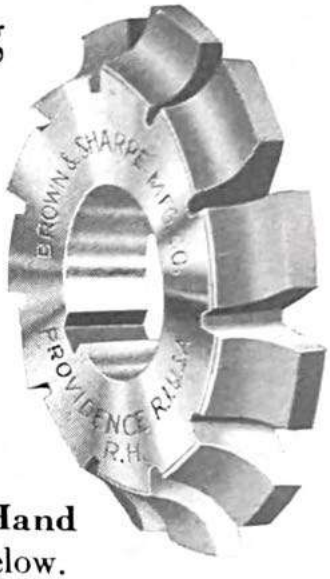
List of Keyways, page 489.



Corner-Rounding Cutters

These cutters have side as well as radial clearance and can be ground without changing their outline.

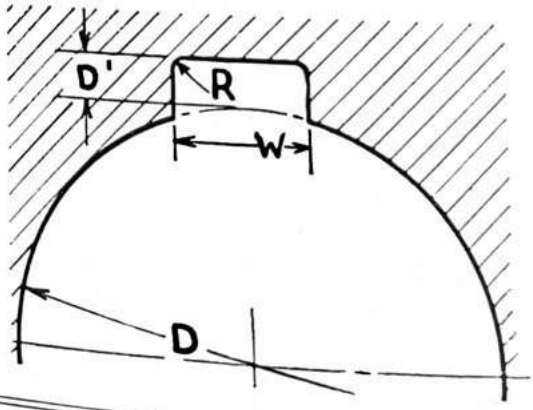
In ordering, state whether Right- or Left-Hand Cutters are wanted.



Left-Hand **Right-Hand**

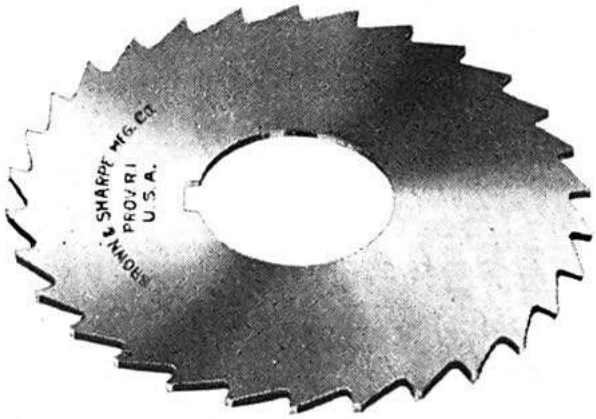
List of Keyways, see table below.

No.	Radius of Circle, Inches	Diameter, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
C-102	1-8	2	7-8	$3.10	$6.20
C-106	1-4	2 1-4	7-8	3.90	7.80
C-108	3-8	3	1	5.70	11.30
C-110	1-2	3 1-4	1	6.60	13.10
C-112	5-8	3 1-2	1	8.00	16.00



Standard Keyways for Cutters

Diam. (D) of Hole, Inches	Width (W) of Keyway, Inches	Depth (D') of Keyway, Inches	Radius (R), Inches	Diam. (D) of Hole, Inches	Width (W) of Keyway, Inches	Depth (D') of Keyway, Inches	Radius (R), Inches
1-2	3-32	3-64	1-64	1 1-2	3-8	5-32	1-16
5-8	1-8	1-16	1-32	1 3-4	7-16	3-16	1-16
3-4	1-8	1-16	1-32	2	1-2	3-16	1-16
7-8	1-8	1-16	1-32	2 1-4	5-8	7-32	1-16
1	1-4	3-32	3-64	2 1-2	5-8	7-32	1-16
1 1-4	5-16	1-8	3-64	2 3-4	3-4	1-4	1-16



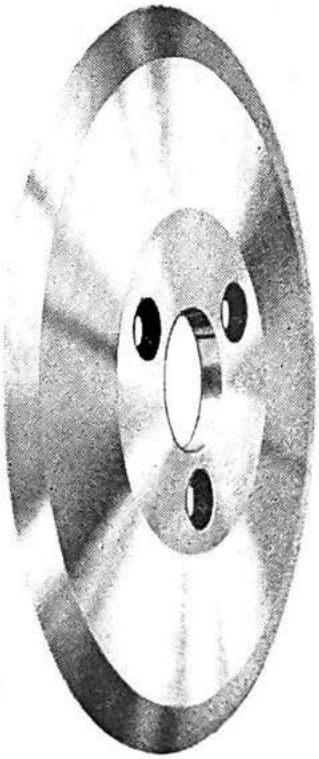
Metal Slitting Saws

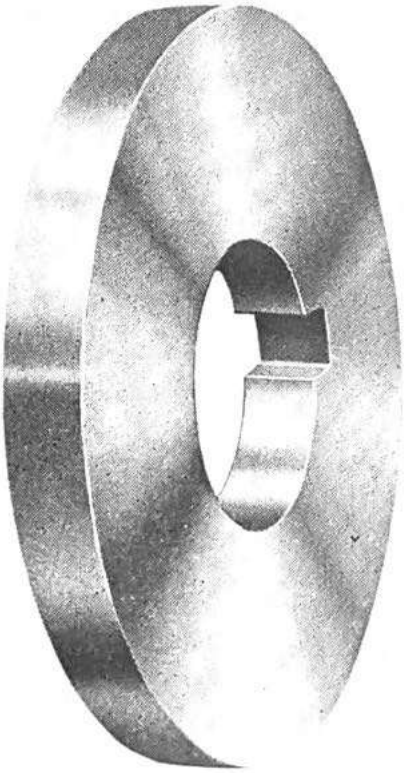
Ground on the sides and left a little thicker at the outer edge than near the center to give proper clearance in cutting deep slots.

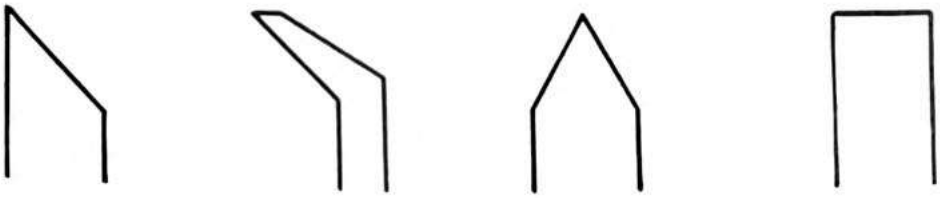
No.	Diameter, Inches	Thickness, Inches	Hole, Inches	Price, Each	
				Carbon Steel	High Speed Steel
G-50	2 1-2	1-32	7-8	$1.40	$2.80
G-51	2 1-2	3-64	7-8	1.40	2.80
G-52	2 1-2	1-16	7-8	1.40	2.80
G-53	2 1-2	3-32	7-8	1.40	2.80
G-54	2 1-2	1-8	7-8	1.50	2.90
G-56	3	1-32	1	1.70	3.30
G-57	3	3-64	1	1.70	3.30
G-58	3	1-16	1	1.70	3.40
G-59	3	3-32	1	1.70	3.40
G-60	3	1-8	1	1.80	3.50
G-61	3	5-32	1	1.90	3.70
G-62	4	1-32	1	2.20	4.30
G-63	4	3-64	1	2.20	4.40
G-64	4	1-16	1	2.30	4.50
G-65	4	3-32	1	2.40	4.70
G-66	4	1-8	1	2.50	5.00
G-67	4	5-32	1	2.60	5.20
G-68	4	3-16	1	2.80	5.50
G-69	5	1-16	1	2.90	5.80
G-70	5	3-32	1	3.20	6.30
G-71	5	1-8	1	3.30	6.60
G-72	5	1-8	1 1-4	3.30	6.60
G-74	5	5-32	1	3.50	7.00
G-75	5	3-16	1	3.70	7.40
G-76	6	1-16	1	3.70	7.30
G-77	6	3-32	1	4.20	8.40
G-78	6	1-8	1	4.30	8.60
G-78A	6	1-8	1 1-4	4.30	8.60
G-80	6	3-16	1	5.20	10.40
G-84	8	1-8	1	8.80	17.50
G-85	8	1-8	1 1-4	8.80	17.50
G-86	8	3-16	1 1-4	9.90	19.80

Other sizes made to order. In ordering special saws, state for what purpose they are required. List of Keyways, page 489.

Rotary Shears







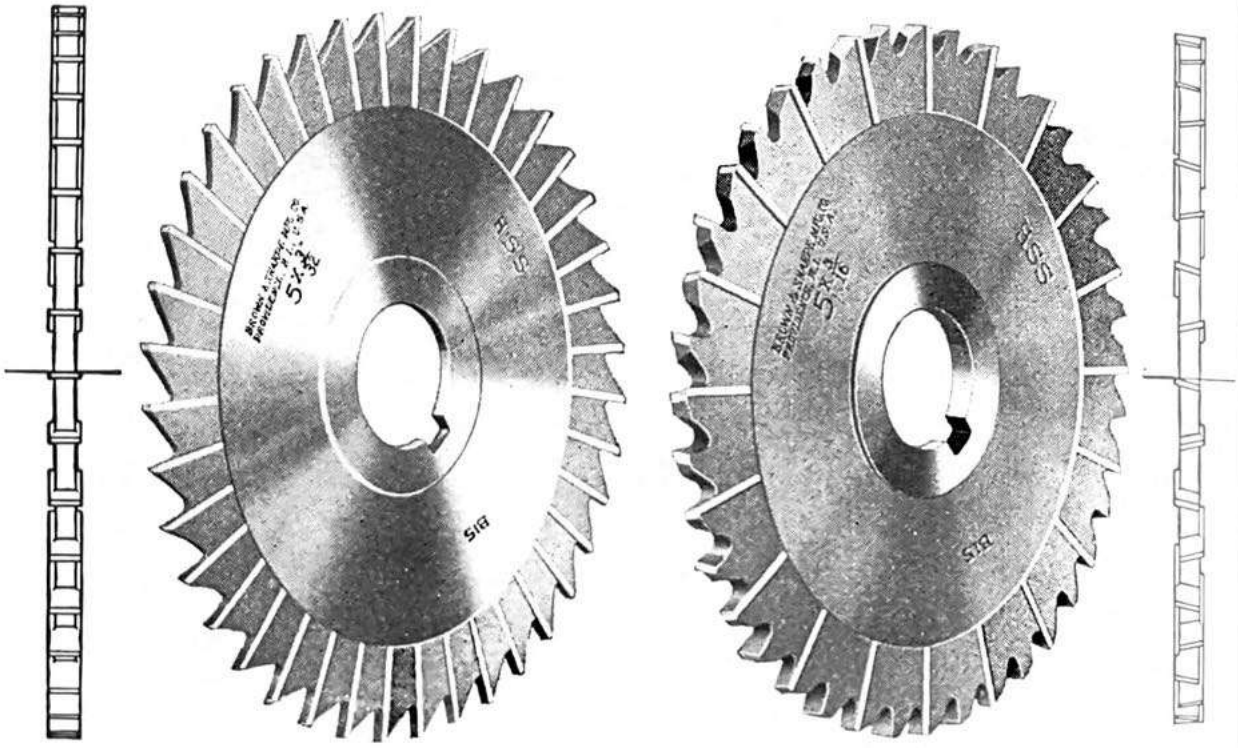
FURNISHED to order to customer's specifications for the stripping or slitting of thin metal, etc. Various forms can be furnished to meet particular requirements. To insure long life and satisfactory service, a special steel is used in their manufacture. Particular attention is paid to heat treatment and to accurately grinding to size. Can be furnished in gangs if desired.

In ordering, give complete specifications such as diameter, thickness, form, size of hole, etc., and also specify use for which the shears are intended.

Metal Slitting Saws

with Side Chip Clearance

HIGH SPEED STEEL



THESE saws are designed to take deep cuts with free-cutting action, thus increasing production and lessening cutter breakage. The design allows the chips to be carried out of the deep slot without jamming so that the saws make, at one cut, deep slots which under ordinary circumstances would be impractical with an ordinary saw. Unusually large chip space is provided and in addition to the pockets at the sides of the teeth, the sides of the saws are recessed. There is also concavity on the lateral cutting edges These extra clearances reduce rubbing and dragging and thus minimize heating and jamming tendencies.

Made with two styles of teeth. Saws up to and including 5/32″ in thickness are made as shown at the left. Saws of 3/16″ thickness are made in the Staggered Tooth type as shown at right. Listed with prices on opposite page.

Metal Slitting Saws

With Side Chip Clearance
HIGH SPEED STEEL

No.	Diameter, Inches	Thickness, Inches	Hole, Inches	Price, Each, High Speed Steel
G-235	3	1-16	1	$6.10
G-236	3	3-32	1	6.00
G-237	3	1-8	1	6.00
G-238	3	5-32	1	6.10
G-245	4	1-16	1	7.90
G-246	4	3-32	1	7.90
G-247	4	1-8	1	8.10
G-248	4	5-32	1	8.30
G-249	4	3-16	1	10.80
G-255	5	3-32	1	10.10
G-256	5	1-8	1	10.40
G-257	5	5-32	1	10.70
G-258	5	3-16	1	14.00
G-265	6	1-8	1	13.10
G-266	6	1-8	1 1-4	13.10
G-267	6	3-16	1	18.50
G-268	6	3-16	1 1-4	18.50
G-285	8	1-8	1	26.90
G-286	8	1-8	1 1-4	26.90
G-288	8	3-16	1 1-4	36.30

Other sizes made to order. It is impractical, however, to make these saws less than 1/16″ thick.

Carbon steel saws made to order. Price on application.

List of Keyways, page 489.

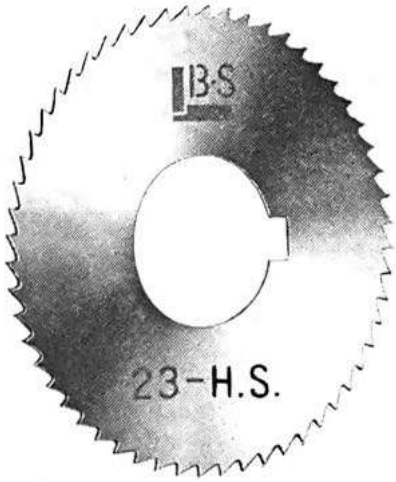
Formed Saws For Slitting Copper

These saws are designed especially for the slitting or sawing of metals that are of a soft or tenacious character and are superior to the ordinary saw usually employed for this purpose.

The teeth are backed off and formed the same as in all formed milling cutters, and are sharpened by grinding the face, thus retaining the outline of the saw. Each alternate tooth is V shaped, and, as the others are flat, the chip is split and forced out sidewise; there is less tendency to clog than with an ordinary saw.

The sides are ground concave for clearance.

These saws are made to order of any desired size.



Screw Slotting Cutters

These cutters have a fine pitch of teeth especially adapted to the slotting of screw heads and similar work. High Speed Steel Cutters only have ground sides.

Cutters 2¾″ diam. have 72 teeth; 2¼″ diam., 60 teeth and 1¾″ diam., 90 teeth. (High Speed Steel Cutters with 1″ hole can also be furnished with 56 teeth.)

No.	Gage No., Amer. Std	Thickness, Inches	Diam., Inches	Hole, Inches		Price, Each	
				Carbon Steel	High Speed Steel	Carbon Steel	High Speed Steel
H-10	5	.182	2 3-4	1	...	$1.15	...
H-11	6	.162	2 3-4	1	1	.95	$3.20
H-12	7	.144	2 3-4	1	1	.85	3.00
H-13	8	.128	2 3-4	3-4, 1	3-4, 1	.70	2.75
H-14	9	.114	2 3-4	3-4, 1	3-4, 1	.65	2.50
H-15	10	.102	2 3-4	3-4, 1	3-4, 1	.60	2.30
H-16	11	.091	2 3-4	3-4, 1	3-4, 1	.55	2.05
H-17	12	.081	2 3-4	3-4, 1	3-4, 1	.55	1.90
H-18	13	.072	2 3-4	3-4, 1	3-4, 1	.55	1.90
H-19	14	.064	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.55	1.80
H-20	15	.057	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.50	1.70
H-21	16	.051	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.50	1.60
H-22	17	.045	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.35	1.55
H-23	18	.040	2 3-4	1-2, 5-8, 3-4, 1	3 4, 1	.35	1.50
H-24	19	.036	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.35	1.50
H-25	20	.032	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.35	1.50
H-26	21	.028	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.30	1.50
H-27	22	.025	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.30	1.50
H-28	23	.023	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.30	1.50
H-29	24	.020	2 3-4	1-2, 5-8, 3-4, 1	3-4, 1	.30	1.50
H-30	25	.018	2 3-4	1-2, 5-8, 3-4, 1	....	.30	....
H-31	26	.016	2 3-4	3-4, 1	....	.30	....
H-32	27	.014	2 3-4	3-4, 1	....	.30	....
H-33	28	.013	2 3-4	3-4, 1	....	.30	....
H-34	30	.010	2 3-4	3-4, 1	....	.30	....
H-35	32	.008	2 3-4	3-4, 1	....	.30	....
H-36	34	.006	2 3-4	3-4, 1	....	.30	....
H-36A	10	.102	2 1-4	5-8	....	.55	....
H-36B	11	.091	2 1-4	5-8	....	.50	....
H-36C	12	.081	2 1-4	5-8	....	.50	....
H-36D	13	.072	2 1-4	5-8	....	.35	....
H-36E	14	.064	2 1-4	5-8	5-8	.35	1.75

List continued on next page.

Screw Slotting Cutters (*Continued*)

No.	Gage No., Amer. Std.	Thickness, Inches	Diam., Inches	Hole, Inches		Price, Each	
				Carbon Steel	High Speed Steel	Carbon Steel	High Speed Steel
H-36F	15	.057	2 1-4	5-8	5-8	$0.30	$1.60
H-36G	16	.051	2 1-4	5-8	5-8	.30	1.50
H-36H	17	.045	2 1-4	5-8	5-8	.30	1.50
H-36I	18	.040	2 1-4	5-8	5-8	.30	1.45
H-36J	19	.036	2 1-4	5-8	5-8	.30	1.45
H-37	20	.032	2 1-4	5-8	5-8	.30	1.45
H-38	21	.028	2 1-4	5-8	5-8	.30	1.45
H-39	22	.025	2 1-4	5-8	5-8	.30	1.45
H-40	23	.023	2 1-4	5-8	5-8	.30	1.45
H-41	24	.020	2 1-4	5-8	5-8	.30	1.45
H-42	25	.018	2 1-4	5-8	....	.30	....
H-43	26	.016	2 1-4	5-8	....	.30	....
H-44	27	.014	2 1-4	5-8	....	.30	....
H-45	28	.013	2 1-4	5-8	....	.30	....
H-46	30	.010	2 1-4	5-8	....	.30	....
H-47	32	.008	2 1-4	5-8	....	.30	....
H-48	34	.006	2 1-4	5-8	....	.30	....
H-49	14	.064	1 3-4	5-8	5-8	.30	1.75
H-50	15	.057	1 3-4	5-8	5-8	.30	1.60
H-51	16	.051	1 3-4	5-8	5-8	.30	1.50
H-52	17	.045	1 3-4	5-8	5-8	.30	1.50
H-53	18	.040	1 3-4	5-8	5-8	.30	1.45
H-54	19	.036	1 3-4	5-8	5-8	.30	1.45
H-55	20	.032	1 3-4	5-8	5-8	.30	1.45
H-56	21	.028	1 3-4	5-8	5-8	.30	1.45
H-57	22	.025	1 3-4	5-8	5-8	.30	1.45
H-58	23	.023	1 3-4	5-8	5-8	.30	1.45
H-59	24	.020	1 3-4	1-2, 5-8	5-8	.25	1.45
H-60	25	.018	1 3-4	1-2, 5-8	....	.25	....
H-61	26	.016	1 3-4	1-2, 5-8	....	.25	....
H-62	27	.014	1 3-4	1-2, 5-8	....	.25	....
H-63	28	.013	1 3-4	1-2, 5-8	....	.25	....
H-64	30	.010	1 3-4	1-2, 5-8	....	.25	....
H-65	32	.008	1 3-4	1-2, 5-8	....	.25	....
H-66	34	.006	1 3-4	1-2, 5-8	....	.25	....

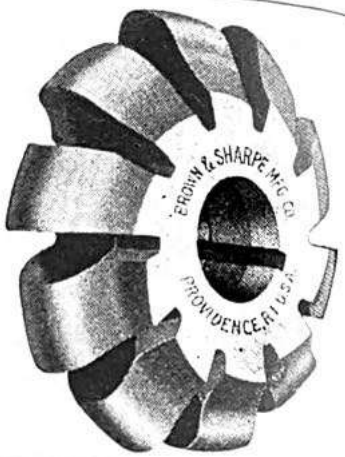
Other sizes made to order.

Cutters of High Speed Steel not listed made to order. Price on application. Screw Slotting Cutter Arbors, page 542. List of Keyways, page 489.

Jewelers' Saws

Many of the Screw Slotting Cutters listed above are suitable for jewelers' use in sawing chain links, etc.

Sprocket Wheel Cutters for Roller Chains



American Standard Tooth Forms Adopted by S.A.E., A.S.M.E., A.G.M.A.

Not carried in stock but can be furnished at short notice.

Pitch, Inches	Diam. of Roll, Inches	No. of Teeth in Sprocket	Diam. of Cutter, Inches	Width of Cutter, Inches	Size of Hole, Inches	Price, Each	
						Carbon Steel	High Speed Steel
3-8	.200	6	2 3-4	15-32	1	On Application.	On Application.
		7 to 8	2 3-4	15-32			
		9 to 11	2 3-4	15-32			
		12 to 17	2 3-4	7-16			
		18 to 34	2 3-4	7-16			
		35 and over	2 3-4	13-32			
1-2 to 5-8	.313	6	3	3-4	1		
		7 to 8	3	3-4			
		9 to 11	3 1-8	3-4			
		12 to 17	3 1-8	3-4			
		18 to 34	3 1-8	23-32			
		35 and over	3 1-8	11-16			
5-8	.400	6	3 1-8	3-4	1		
		7 to 8	3 1-8	3-4			
		9 to 11	3 1-4	3-4			
		12 to 17	3 1-4	3-4			
		18 to 34	3 1-4	23-32			
		35 and over	3 1-4	11-16			
3-4	.469	6	3 1-4	29-32	1		
		7 to 8	3 1-4	29-32			
		9 to 11	3 3-8	29-32			
		12 to 17	3 3-8	7-8			
		18 to 34	3 3-8	27-32			
		35 and over	3 3-8	13-16			
1	.563	6	3 3-4	1 1-4	1 1-4		
		7 to 8	3 7-8	1 1-4			
		9 to 11	3 7-8	1 3-16			
		12 to 17	4	1 5-32			
		18 to 34	4	1 1-8			
		35 and over	4	1 3-32			

List continued on next page.

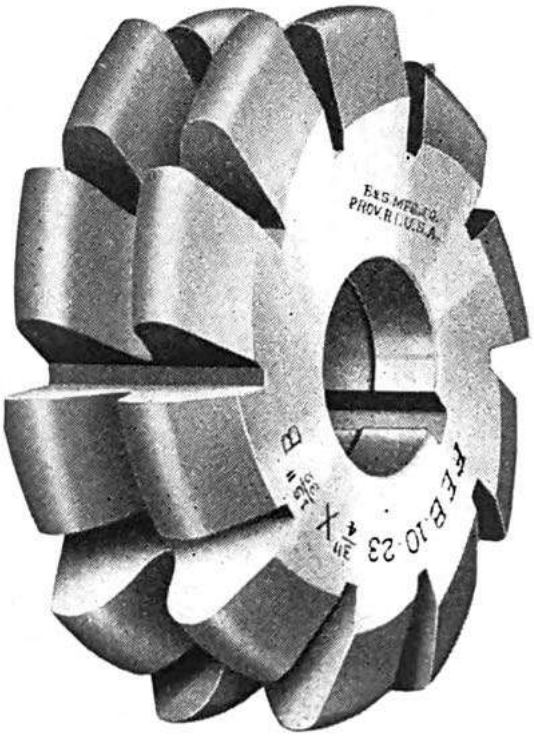
List of Keyways, page 489.

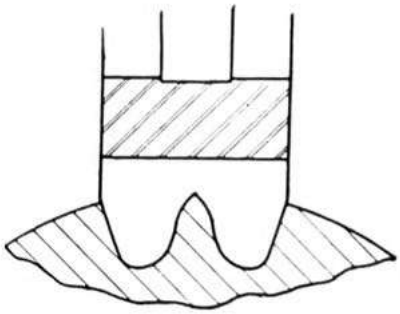
Sprocket Wheel Cutters (*Continued*)

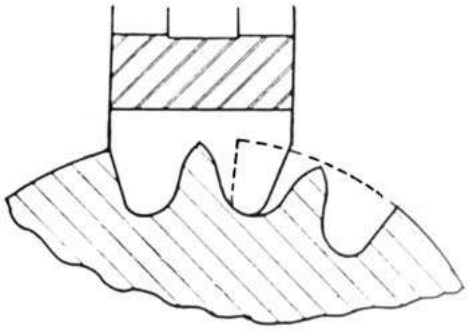
Pitch, Inches	Diam. of Roll, Inches	No. of Teeth in Sprocket	Diam. of Cutter, Inches	Width of Cutter, Inches	Size of Hole, Inches	Price, Each	
						Carbon Steel	High Speed Steel
1 to 1 1-4	.625	6	3 7-8	1 1-2	1 1-4	On Application.	On Application.
		7 to 8	4	1 1-2			
		9 to 11	4 1-8	1 15-32			
		12 to 17	4 1-8	1 15-32			
		18 to 34	4 1-4	1 13-32			
		35 and over	4 1-4	1 11-32			
1 1-4 to 1 1-2	.750	6	4 1-4	1 13-16	1 1-4		
		7 to 8	4 3-8	1 13-16			
		9 to 11	4 1-2	1 25-32			
		12 to 17	4 1-2	1 3-4			
		18 to 34	4 5-8	1 11-16			
		35 and over	4 5-8	1 5-8			
1 1-2	.875	6	4 3-8	1 13-16	1 1-4		
		7 to 8	4 1-2	1 13-16			
		9 to 11	4 5-8	1 25-32			
		12 to 17	4 5-8	1 3-4			
		18 to 34	4 3-4	1 11-16			
		35 and over	4 3-4	1 5-8			
1 3-4	1.000	6	5	2 3-32	1 1-2		
		7 to 8	5 1-8	2 3-32			
		9 to 11	5 1-4	2 1-16			
		12 to 17	5 3-8	2 1-32			
		18 to 34	5 1-2	1 31-32			
		35 and over	5 1-2	1 7-8			
2	1.125	6	5 3-8	2 13-32	1 1-2		
		7 to 8	5 1-2	2 13-32			
		9 to 11	5 5-8	2 3-8			
		12 to 17	5 3-4	2 5-16			
		18 to 34	5 7-8	2 1-4			
		35 and over	5 7-8	2 5-32			
2 1-2	1.563	6	6 3-8	3	1 3-4		
		7 to 8	6 5-8	3			
		9 to 11	6 3-4	2 15-16			
		12 to 17	6 7-8	2 29-32			
		18 to 34	7	2 3-4			
		35 and over	7 1-8	2 11-16			
3	1.900	6	7 1-2	3 19-32	2		
		7 to 8	7 3-4	3 19-32			
		9 to 11	7 7-8	3 17-32			
		12 to 17	8	3 15-32			
		18 to 34	8	3 11-32			
		35 and over	8 1-4	3 7-32			

List of Keyways, page 489.

Straddle Sprocket Cutters







Only two cutters are required for the complete range of teeth in any one pitch. One cutter cuts all sprockets having 17 teeth and under; the other cutter cuts all sprockets having 18 teeth and over.

When ordering, specify pitch, diameter of roller and range of teeth to be cut. Sizes and prices upon application.

Gear Cutters

These cutters for the teeth of gears are so made that they can be sharpened by grinding the faces of the teeth, and this operation can be repeated without altering the form of the tooth which the cutter makes.

Orders should be given by the following tables, stating the number of cutter and the diametral pitch required. By diametral pitch is meant the number of teeth in a gear per inch of pitch diameter. In ordering cutters for worm gears, give the number of teeth in gear, the diameter of worm and number of threads to the inch.

Involute Gear Cutters

Eight Cutters are made for each pitch, as follows:

No. 1	will	cut	gears	from	135	teeth	to a rack	
" 2	"	"	"	"	55	to	134	teeth
" 3	"	"	"	"	35	"	54	"
" 4	"	"	"	"	26	"	34	"
" 5	"	"	"	"	21	"	25	"
" 6	"	"	"	"	17	"	20	"
" 7	"	"	"	"	14	"	16	"
" 8	"	"	"	"	12	"	13	"

For use where a finer division of the number of teeth to be cut with each cutter than can be cut with the regular number is required, we are prepared to furnish to order Gear Cutters from 1 to 8 pitch inclusive in half numbers.

The Nos. 1 to 8, as listed above, are the regular cutters as furnished. The half numbers are as follows:

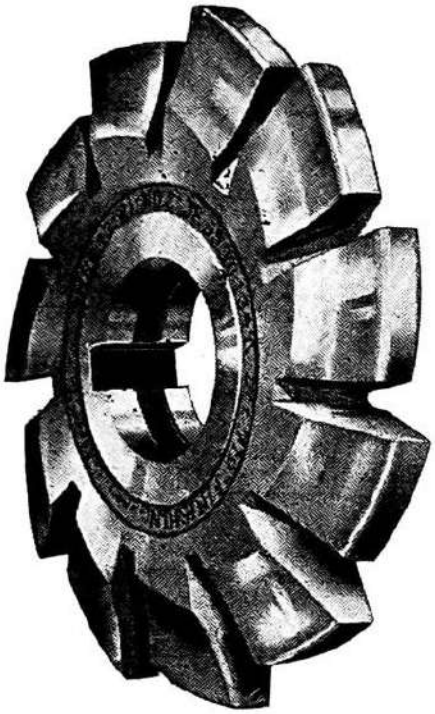
No. of Cutter	Range, Teeth	No. of Cutter	Range, Teeth
1 1-2	80 to 134	5 1-2	19 to 20
2 1-2	42 " 54	6 1-2	15 " 16
3 1-2	30 " 34	7 1-2	13
4 1-2	23 " 25		

Prices for half numbers on application.

In ordering, give the number of cutter and diametral pitch required. Cutters in stock can be ordered by telegraph.

Form of Telegram:—*Send one Cutter No. 5, 8 pitch (Carbon Steel or High Speed Steel).*

When ordering Cutters for Bevel Gears, note instructions given on pages 505 to 509 inclusive.



Ground-Form Cutters

THE primary thought behind the development of the Ground-Form Cutter by the Brown & Sharpe Mfg. Co. was to obtain a cutter capable of producing greater accuracy of work than could be obtained with one of the unground type. From the beginning we foresaw some very promising advantages in the Ground-Form Cutter—a cutter capable of producing work of a very high degree of accuracy—ability to duplicate this degree of accuracy continuously with succeeding cutters—a possible increase in production, and a much longer lived cutter that would be more economical, considering all factors that enter into cutter cost.

In every way the results obtained in the hands of prominent manufacturers in this country and abroad, have exceeded our expectations, particularly in the matter of increased production obtained and ultimate cutter economy secured. While we can furnish ground-form cutters for gears, sprockets, and spline shafts, and for other uses where the size and form are within certain limitations, we call particular attention to the merits of ground-form gear cutters, which can be furnished for pitches, from 1¾ to 12, inclusive.

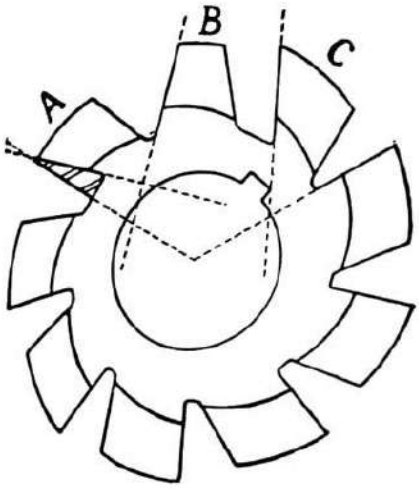
The outstanding advantages are as follows:

Accuracy of Form—The primary requirement in precision gear cutting—is assured by the grinding of the tooth form—correcting all hardening distortions.

Duplication of Accuracy in different cutters through this positive control of form gives the user of cutters further ability to duplicate a high degree of accuracy in the finished gears—a continued accuracy and uniformity which makers of gears strive to maintain.

Increased Production, due to the freer cutting action and keener cutting edges of these cutters, has been proven by actual tests to be surprisingly great. The freer cutting action, which is largely responsible for this increased production, is due to each tooth doing its share of the cutting, for the grinding of the form has so corrected any hardening distortions that no single tooth or group of teeth can do the major part of the work—each must do its share. Consequently the finish is correspondingly improved and cutter wear greatly reduced. As to cost, these Ground-Form Cutters necessarily list somewhat higher than those with the unground form, but their ability to produce more and better gears per sharpening of the cutter will effect a pronounced saving in ultimate cutter cost—they mean high cutter economy from all angles, both as to quality and quantity of the gears produced.

Sharpening Gear and Formed Cutters



FOR economy, cutters must be kept well sharpened. Sharp cutters give faster production, consume less power, produce better surfaces and wear longer. Use a bevel and concave wheel of medium grain and soft grade, just hard enough to prevent the grit flying about. Keep the wheel clean, as a glazed wheel draws the cutter temper, also keep the corner sharp to give a true surface the entire length of the cutter tooth.

In grinding the cutter, the face of every tooth must be kept radial, and all must be of the same height. When not ground radially, they are either "hooking," like C which cuts too deep, or "dragging," as B which cuts too shallow. Besides this, all cutter teeth are relieved so that the cutting outline of the tooth remains correct only when ground radially. Hence such teeth as A, B, and C will cut gear teeth of the wrong shape. Be careful also to keep each tooth face square with the sides of the cutter, avoiding mistakes like A. If some of the teeth are longer than others, the long teeth will do all the cutting.

To Set a Gear Cutter Central

THE indicator furnished with our Automatic Gear Cutting Machine allows settings sufficiently accurate for ordinary work. When a very accurate and quiet-running gear is required, however, it is absolutely essential that the cutter be exactly central.

The best method of setting the cutter central is first to turn a blank identical in diameter with the gear to be cut, and, after centering it as nearly as possible, take a single cut through the blank. Without changing the position of the cutter, remove the blank from the work arbor and turn it end for end. Leave the blank loose on the arbor and feed the cutter into the slot already cut. Then revolve the cutter by pulling the belt so as to mark its position in relation to the slot produced at the first cut.

If the cutter is exactly central, the second cut will follow the outline of the first; but if out of center, the cutter at its second passage will cut some stock from the top of the space on one side and from the bottom on the other side. In the latter case the cutter should be moved laterally away from the side of the tooth from which the stock was taken at the deepest part of cut and another cut taken in another part of the blank, and the above operations repeated until the cutter is properly centered.

Involute Spur Gear Cutters

All gears of same pitch cut with these cutters are interchangeable.

In ordering specify diametral pitch and number of cutter. Eight cutters made for each pitch. See page 499.

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each	
			Carbon Steel	High Speed Steel
*1	8 1-2	2	**$75.90**	$151.80
*1 1-4	7 3-4	2	**59.20**	118.30
*1 1-2	7	1 3-4	**38.90**	77.80
1 3-4	6 1-2	1 3-4	**30.20**	60.40
2	5 3-4	1 1-2	**22.30**	44.50
2 1-2	5 3-4	1 1-2	**20.00**	40.00
3	4 3-4	1 1-4	**12.60**	25.10
4	4 1-4	1 1-4	**9.60**	19.20
5	3 3-4	1 1-4	**7.80**	15.50
6	3 1-8	1	**6.20**	12.30
7	2 7-8	1	**5.40**	10.70
8	2 7-8	1	**5.10**	10.20
9	2 3-4	1	**4.50**	9.00
10	2 3-8	7-8	**4.10**	8.20
11	2 3-8	7-8	**4.00**	7.90
12	2 1-4	7-8	**3.60**	7.20
14	2 1-8	7-8	**3.50**	6.90
16	2 1-8	7-8	**3.50**	6.90
18	2	7-8	**3.10**	6.20
20	2	7-8	**3.10**	6.20
22	2	7-8	**3.10**	6.20
24	1 3-4	7-8	**3.00**	6.00
26	1 3-4	7-8	**2.90**	5.80
28	1 3-4	7-8	**2.90**	5.80
30	1 3-4	7-8	**2.90**	5.80
32	1 3-4	7-8	**2.90**	5.80
36	1 3-4	7-8	**2.90**	5.80
40	1 3-4	7-8	**2.90**	5.80
48	1 3-4	7-8	**2.90**	5.80

*Not kept in stock, but made to order.

Cutters for pitches not given in the list above made to order.

List of Keyways, page 489.

Involute Spur Gear Cutters

FOR USE ON

BROWN & SHARPE AUTOMATIC GEAR CUTTING MACHINES

In ordering specify diametral pitch and number of cutter. Eight cutters made for each pitch. See page 499.

FOR NO. 3 AUTOMATIC GEAR CUTTING MACHINE

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each	
			Carbon Steel	High Speed Steel
4	3 5-8	1	$8.20	$16.40
5	3 3-8	1	7.20	14.30
6	3 1-8	1	6.20	12.30
7	2 7-8	1	5.40	10.70
8	2 7-8	1	5.10	10.20
9	2 3-4	1	4.50	9.00
10	2 3-4	1	4.50	9.00
11	2 5-8	1	4.30	8.60
12	2 5-8	1	4.30	8.60
14	2 1-2	1	3.80	7.60
16	2 1-2	1	3.80	7.60
18	2 3-8	1	3.80	7.60
20	2 3-8	1	3.80	7.60
22	2 1-4	1	3.50	6.90
24	2 1-4	1	3.50	6.90

FOR NOS. 4 AND 13H AUTOMATIC GEAR CUTTING MACHINES

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each	
			Carbon Steel	High Speed Steel
3	4 3-4	1 1-4	$12.60	$25.10
4	4 1-4	1 1-4	9.60	19.20
5	3 3-4	1 1-4	7.80	15.50
6	3 1-2	1 1-4	6.70	13.40
7	3 3-8	1 1-4	6.30	12.60
8	3 1-4	1 1-4	5.60	11.10
9	3 1-8	1 1-4	5.40	10.70
10	3	1 1-4	4.90	9.80
12	2 7-8	1 1-4	4.70	9.40

List continued on next page.

Cutters for pitches not given in the lists above made to order.

List of Keyways, page 489.

Involute Spur Gear Cutters

FOR USE ON BROWN & SHARPE AUTOMATIC GEAR CUTTING MACHINES (*Continued*)

In ordering specify diametral pitch and number of cutter. Eight cutters made for each pitch. See page 499.

FOR NO. 5 AUTOMATIC GEAR CUTTING MACHINE

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each	
			Carbon Steel	High Speed Steel
2	5 3-4	1 1-2	**$22.30**	$44.50
2 1-2	5 3-4	1 1-2	**20.00**	40.00
3	5 1-4	1 1-2	**14.50**	29.00
4	4 1-2	1 1-2	**10.40**	20.70
5	4 1-4	1 1-2	**9.00**	18.00
6	3 7-8	1 1-2	**7.90**	15.70

FOR NO. 6 AUTOMATIC GEAR CUTTING MACHINE

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each	
			Carbon Steel	High Speed Steel
1 3-4	6 1-2	1 3-4	**$30.20**	$60.40
2	6 1-2	1 3-4	**26.30**	52.60
2 1-2	6 1-8	1 3-4	**23.70**	47.30
3	5 5-8	1 3-4	**17.80**	35.50
4	4 3-4	1 3-4	**11.10**	22.20
5	4 3-8	1 3-4	**9.70**	19.40
6	4 1-4	1 3-4	**8.40**	16.80

Cutters for pitches not given in the lists above made to order.

List of Keyways, page 489.

Cutters for Mitre and Bevel Gears

These cutters are thin enough to cut any bevel gear whose tooth face is not longer than one third the distance from its outer end to the point where the shaft center-lines meet. This makes the tooth thickness at the inner end not less than two thirds that at the outer end.

In ordering cutters for bevel gears, give diametral pitch and number of cutter. See information below and pages 506 to 509 for directions and tables for selecting Bevel Gear Cutters.

We can select the proper cutter to send if the customer will give number of teeth in each gear, the pitch and length of face and angle of the shafts, if different from a right angle.

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each	
			Carbon Steel	High Speed Steel
3	4	1 1-4	**$10.00**	**$19.90**
4	3 5-8	1 1-4	**8.20**	**16.40**
5	3 3-8	1 1-4	**7.20**	**14.30**
6	3 1-8	1	**6.20**	**12.30**
7	2 7-8	1	**5.40**	**10.70**
8	2 7-8	1	**5.10**	**10.20**
10	2 3-8	7-8	**4.10**	**8.20**
12	2 1-4	7-8	**3.60**	**7.20**
14	2 1-8	7-8	**3.50**	**6.90**
16	2 1-8	7-8	**3.50**	**6.90**
20	2	7-8	**3.10**	**6.20**
24	1 3-4	7-8	**3.00**	**6.00**

Cutters for pitches not given in the above list made to order.
List of Keyways, page 489.

Selecting Cutters for Bevel Gears with Axes at Right Angles Only

The following tables are for use in selecting cutters for cutting bevel gears. The various numbers of teeth in gear and pinion are given, and at the intersection of the two columns will be found the numbers of the cutters required. Number of cutter for gear is given first.

Example.—Required cutters for a pair of bevel gears, 8 pitch; gear 24 teeth, pinion 12 teeth.

In column at left of table, page 506, will be found 24 teeth, and in column at top 12 teeth; at the intersection of these two columns will be found the numbers of the cutters, in this case No. 3 for the gear and No. 8 for the pinion.

Cutters for Use in Cutting Bevel Gears

PINION

GEAR	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12	7-7																		
13	6-7	6-6																	
14	5-7	6-6	6-6																
15	5-7	5-6	5-6	5-5															
16	4-7	5-7	5-6	5-6	5-5														
17	4-7	4-7	4-6	5-6	5-5	5-5													
18	4-7	4-7	4-6	4-6	4-5	4-5	5-5												
19	3-7	4-7	4-6	4-6	4-6	4-5	4-5	4-4											
20	3-7	3-7	4-6	4-6	4-6	4-5	4-5	4-4	4-4										
21	3-8	3-7	3-7	3-6	4-6	4-5	4-5	4-5	4-4	4-4									
22	3-8	3-7	3-7	3-6	3-6	3-5	4-5	4-5	4-4	4-4	4-4								
23	3-8	3-7	3-7	3-6	3-6	3-5	3-5	3-5	3-4	4-4	4-4	4-4							
24	3-8	3-7	3-7	3-6	3-6	3-6	3-5	3-5	3-4	3-4	3-4	4-4	4-4						
25	2-8	2-7	3-7	3-6	3-6	3-6	3-5	3-5	3-5	3-4	3-4	3-4	4-4	3-3					
26	2-8	2-7	3-7	3-6	3-6	3-6	3-5	3-5	3-5	3-4	3-4	3-4	3-4	3-3	3-3				
27	2-8	2-7	2-7	2-6	3-6	3-6	3-5	3-5	3-5	3-4	3-4	3-4	3-4	3-4	3-3	3-3			
28	2-8	2-7	2-7	2-6	2-6	3-6	3-5	3-5	3-5	3-4	3-4	3-4	3-4	3-4	3-3	3-3	3-3		
29	2-8	2-7	2-7	2-7	2-6	2-6	3-5	3-5	3-5	3-4	3-4	3-4	3-4	3-4	3-3	3-3	3-3	3-3	
30	2-8	2-7	2-7	2-7	2-6	2-6	2-5	2-5	3-5	3-5	3-4	3-4	3-4	3-4	3-4	3-3	3-3	3-3	3-3
31	2-8	2-7	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	3-4	3-4	3-4	3-4	3-4	3-3	3-3	3-3	3-3
32	2-8	2-7	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-4	2-4	3-4	3-4	3-4	3-3	3-3	3-3	3-3
33	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-4	2-4	2-4	3-4	3-4	3-4	3-3	3-3	3-3
34	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	3-4	3-3	3-3	3-3
35	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3	3-3	3-3
36	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-3	2-3	2-3
37	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-3	2-3	2-3
38	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3	2-3
39	2-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3	2-3
40	1-8	2-8	2-7	2-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3	2-3
41	1-8	1-8	2-7	2-7	2-6	2-6	2-6	2-6	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3	2-3
42	1-8	1-8	2-7	2-7	2-6	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-3	2-3
43	1-8	1-8	1-7	2-7	2-6	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
44	1-8	1-8	1-7	1-7	2-6	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
45	1-8	1-8	1-7	1-7	1-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
46	1-8	1-8	1-7	1-7	1-7	2-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
47	1-8	1-8	1-7	1-7	1-7	1-6	2-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
48	1-8	1-8	1-7	1-7	1-7	1-6	1-6	2-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
49	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-3
50	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	2-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-4
51	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	2-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-4
52	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	2-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-4
53	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	2-5	2-4	2-4	2-4	2-4	2-4	2-4	2-4
54	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	2-4	2-4	2-4	2-4	2-4	2-4	2-4
55	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	2-4	2-4	2-4	2-4	2-4	2-4

Cutters for Use in Cutting Bevel Gears

(Continued)

PINION

GEAR	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
31	3-3																			
32	3-3	3-3																		
33	3-3	3-3	3-3																	
34	3-3	3-3	3-3	3-3																
35	3-3	3-3	3-3	3-3	3-3															
36	2-3	3-3	3-3	3-3	3-3	3-3														
37	2-3	2-3	2-3	2-3	3-3	3-3	3-3													
38	2-3	2-3	2-3	2-3	2-3	3-3	3-3	3-3												
39	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2											
40	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2										
41	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2									
42	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2								
43	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2							
44	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2						
45	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2					
46	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2				
47	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2			
48	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2		
49	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2	
50	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2
51	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2
52	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
53	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
54	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
55	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2

Cutters for Use in Cutting Bevel Gears

(Continued)

PINION

GEAR	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
56	1-8	1-8	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	2-4	2-4	2-4	2-4	2-4
57	1-8	1-8	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	2-4	2-4	2-4	2-4
58	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	2-4	2-4	2-4
59	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	2-4	2-4
60	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	2-4
61	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
62	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
63	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
64	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
65	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
66	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
67	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
68	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
69	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
70	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
71	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
72	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
73	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
74	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
75	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
76	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
77	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
78	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
79	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
80	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
81	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
82	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
83	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
84	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
85	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
86	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
87	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
88	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
89	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
90	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
91	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
92	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
93	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
94	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
95	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
96	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
97	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
98	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
99	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4
100	1-8	1-8	1-7	1-7	1-7	1-6	1-6	1-6	1-6	1-5	1-5	1-5	1-5	1-4	1-4	1-4	1-4	1-4	1-4

Cutters for Use in Cutting Bevel Gears

(Continued)

PINION

GEAR	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
56	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
57	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
58	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
59	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2	2-2
60	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2
61	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2
62	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2
63	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2
64	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2
65	1-4	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2	2-2
66	1-4	1-3	1-3	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2
67	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2
68	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2
69	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2
70	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-3	2-3	2-3	2-2	2-2	2-2	2-2	2-2
71	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-3	2-2	2-2	2-2	2-2	2-2
72	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-2	2-2	2-2	2-2	2-2
73	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	2-2	2-2	2-2
74	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	2-2	2-2
75	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2	1-2
76	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2	1-2
77	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2	1-2
78	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2	1-2
79	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2	1-2
80	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
81	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
82	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
83	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
84	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
85	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
86	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
87	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
88	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
89	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
90	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2	1-2
91	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
92	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
93	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
94	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
95	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
96	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
97	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
98	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
99	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2
100	1-4	1-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-2	1-2

Formulas for Determining the Dimensions of Gears by Metric Pitch

Module is the pitch diameter in millimeters divided by the number of teeth in the gear.

Pitch diameter in millimeters is the Module multiplied by the number of teeth in the gear.

$$M = \frac{D'}{N} \text{ or } \frac{D}{N+2} = \text{Module}$$

$$D' = N\,M = \text{The pitch diameter of gear in millimeters}$$

$$D = (N+2)\,M = \text{The whole diameter of gear in millimeters}$$

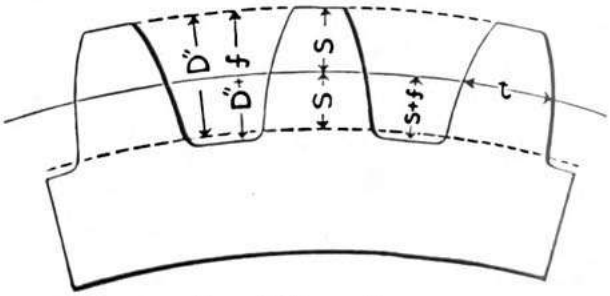
$$N = \frac{D'}{M} \text{ or } \frac{D}{M} - 2 = \text{The number of teeth in gear}$$

$$D'' = 2\,M = \text{The working depth of teeth}$$

$$t = M\,1.5708 = \text{Thickness of teeth on pitch line}$$

$$f = \frac{M\,1.5708}{10} = .157\,M = \text{Amount added to depth for clearance}$$

The Module is equal to the part marked "S" in cut opposite, measured in millimeters and parts of millimeters.



Pitches Commonly Used

Module in Millimeters

Module, mm	Corresponding English Diametral Pitch	Module, mm	Corresponding English Diametral Pitch	Module, mm	Corresponding English Diametral Pitch
0.5	50.800	2.75	9.236	8.	3.175
0.75	33.867	3.	8.466	9.	2.822
1.	25.400	3.5	7.257	10.	2.540
1.25	20.320	4.	6.350	11.	2.309
1.5	16.933	4.5	5.644	12.	2.117
1.75	14.514	5.	5.080	13.	1.954
2.	12.700	5.5	4.618	14.	1.814
2.25	11.288	6.	4.233	15.	1.693
2.5	10.160	7.	3.628	16.	1.587

Metric Involute Spur Gear Cutters

We are prepared to furnish, at short notice, cutters for cutting the teeth of gears according to the Metric system.

Module is the Pitch Diameter in millimeters divided by the number of teeth in the gear.

Pitch Diameter in millimeters is the Module multiplied by the number of teeth in the gear.

M = Module — D′ = Pitch Diameter in mm

N = No. of Teeth in Gear — D′ = M × N

For example: M = 3.50 mm; N = 100; D′ = 3.50 × 100 = 350 mm.

See, also, explanation on preceding page.

In ordering specify Module and number of cutter. Eight cutters made for each pitch. See page 499.

Module, mm	Diameter, Inches	Hole	Price, Each	
			Carbon Steel	High Speed Steel
1-2	1 3-4	7-8″ or 22 mm	$2.90	$5.80
3-4	1 3-4	7-8 or 22	2.90	5.80
1	1 3-4	7-8 or 22	3.00	6.00
1 1-4	2	7-8 or 22	3.10	6.20
1 1-2	2 1-8	7-8 or 22	3.50	6.90
1 3-4	2 1-8	7-8 or 22	3.50	6.90
2	2 1-4	7-8 or 22	3.60	7.20
2 1-4	2 3-8	7-8 or 22	4.00	7.90
2 1-2	2 3-8	7-8 or 22	4.10	8.20
2 3-4	2 3-4	1 or 27	4.50	9.00
3	2 7-8	1 or 27	5.10	10.20
3 1-4	2 7-8	1 or 27	5.40	10.70
3 1-2	2 7-8	1 or 27	5.40	10.70
3 3-1	2 7-8	1 or 27	5.70	11.30
4	3 1-8	1 or 27	6.20	12.30
4 1-4	3 1-8	1 or 27	6.20	12.30
4 1-2	3 3-4	1 1-4 or 32	7.30	14.50
4 3-4	3 3-4	1 1-4 or 32	7.80	15.50
5	3 3-4	1 1-4 or 32	7.80	15.50
5 1-4	3 3-4	1 1-4 or 32	7.80	15.50
5 1-2	4	1 1-4 or 32	8.40	16.70
5 3-4	4	1 1-4 or 32	8.90	17.80
6	4 1-4	1 1-4 or 32	9.60	19.20
7	4 1-2	1 1-4 or 32	11.00	22.00
8	4 3-4	1 1-4 or 32	12.60	25.10
9	5 1-2	1 1-2 or 40	16.50	33.00
10	5 3-4	1 1-2 or 40	20.00	40.00
11	5 3-4	1 1-2 or 40	21.10	42.20
12	5 3-4	1 1-2 or 40	22.30	44.50

Cutters for pitches not given in the above list made to order.

List of Keyways, page 489.

Metric Involute Spur Gear Cutters

FOR USE ON BROWN & SHARPE GEAR CUTTING MACHINES

In ordering specify Module and number of cutter. See page 499.

FOR NO. 3 AUTOMATIC GEAR CUTTING MACHINE

Module, mm	Diameter, Inches	Hole	Price, Each	
			Carbon Steel	High Speed Steel
1	2 1-4	1″ or 27 mm	$3.50	$6.90
1 1-4	2 3-8	1 or 27	3.80	7.60
1 1-2	2 1-2	1 or 27	3.80	7.60
1 3-4	2 1-2	1 or 27	3.80	7.60
2	2 5-8	1 or 27	4.30	8.60
2 1-4	2 5-8	1 or 27	4.30	8.60
2 1-2	2 3-4	1 or 27	4.50	9.00
2 3-4	2 3-4	1 or 27	4.50	9.00
3	2 7-8	1 or 27	5.10	10.20
3 1-4	2 7-8	1 or 27	5.40	10.70
3 1-2	2 7-8	1 or 27	5.40	10.70
3 3-4	2 7-8	1 or 27	5.70	11.30
4	3 1-8	1 or 27	6.20	12.30
4 1-4	3 1-8	1 or 27	6.20	12.30
4 1-2	3 1-4	1 or 27	6.20	12.30
5	3 3-8	1 or 27	7.20	14.30
5 1-2	3 1-2	1 or 27	7.20	14.30
6	3 5-8	1 or 27	8.20	16.40

FOR NOS. 4 & 13H AUTOMATIC GEAR CUTTING MACHINES

Module, mm	Diameter, Inches	Hole	Price, Each	
			Carbon Steel	High Speed Steel
2	2 7-8	1 1-4″ or 32 mm	$4.70	$9.40
2 1-4	2 7-8	1 1-4 or 32	4.70	9.40
2 1-2	3	1 1-4 or 32	4.90	9.80
3	3 1-4	1 1-4 or 32	5.60	11.10
3 1-2	3 3-8	1 1-4 or 32	6.30	12.60
4	3 1-2	1 1-4 or 32	6.70	13.40
4 1-2	3 3-4	1 1-4 or 32	7.30	14.50
4 3-4	3 3-4	1 1-4 or 32	7.80	15.50
5	3 3-4	1 1-4 or 32	7.80	15.50
5 1-4	3 3-4	1 1-4 or 32	7.80	15.50
5 1-2	4	1 1-4 or 32	8.40	16.70
5 3-4	4	1 1-4 or 32	8.90	17.80
6	4 1-4	1 1-4 or 32	9.60	19.20
7	4 1-2	1 1-4 or 32	11.00	22.00
8	4 3-4	1 1-4 or 32	12.60	25.10

List continued on next page. List of Keyways, page 489.

Cutters for pitches not given in the above lists made to order.

Metric Involute Spur Gear Cutters

FOR USE ON

BROWN & SHARPE GEAR CUTTING MACHINES

(Continued)

In ordering specify Module and number of cutter. See page 499.

FOR NO. 5 AUTOMATIC GEAR CUTTING MACHINE

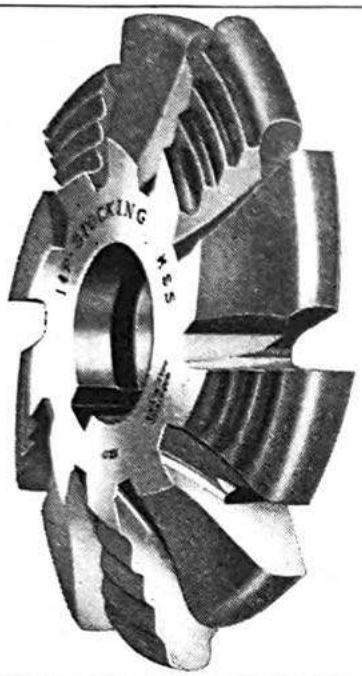
Module, mm	Diameter, Inches	Hole	Price, Each	
			Carbon Steel	High Speed Steel
3	3 1-2	1 1-2″ or 40 mm	$6.10	$12.10
3 1-2	3 5-8	1 1-2 or 40	6.80	13.50
4	3 7-8	1 1-2 or 40	7.90	15.70
4 1-2	4 1-8	1 1-2 or 40	8.40	16.80
5	4 1-4	1 1-2 or 40	9.00	18.00
5 1-2	4 3-8	1 1-2 or 40	9.70	19.40
6	4 1-2	1 1-2 or 40	10.40	20.70
7	4 7-8	1 1-2 or 40	12.80	25.50
8	5 1-4	1 1-2 or 40	14.50	29.00
9	5 1-2	1 1-2 or 40	16.50	33.00
10	5 3-4	1 1-2 or 40	20.00	40.00
11	5 3-4	1 1-2 or 40	21.10	42.20
12	5 3-4	1 1-2 or 40	22.30	44.50

FOR NO. 6 AUTOMATIC GEAR CUTTING MACHINE

Module, mm	Diameter, Inches	Hole	Price, Each	
			Carbon Steel	High Speed Steel
4	4 1-4	1 3-4″ or 45 mm	$8.40	$16.80
4 1-2	4 3-8	1 3-4 or 45	9.10	18.10
5	4 3-8	1 3-4 or 45	9.70	19.40
5 1-2	4 5-8	1 3-4 or 45	10.40	20.80
6	4 3-4	1 3-4 or 45	11.10	22.20
7	5 1-4	1 3-4 or 45	13.70	27.30
8	5 5-8	1 3-4 or 45	17.80	35.50
9	5 7-8	1 3-4 or 45	18.90	37.70
10	6 1-8	1 3-4 or 45	23.70	47.30
11	6 1-2	1 3-4 or 45	25.00	49.90
12	6 1-2	1 3-4 or 45	26.30	52.60

Cutters for pitches not given in the above lists made to order.

List of Keyways, page 489.



Stocking Cutters For Involute Spur Gears With Undercut Teeth

HIGH SPEED STEEL

By the use of these cutters, heavy cuts at fast speeds and coarse feeds can be taken because of the easier cutting action produced.

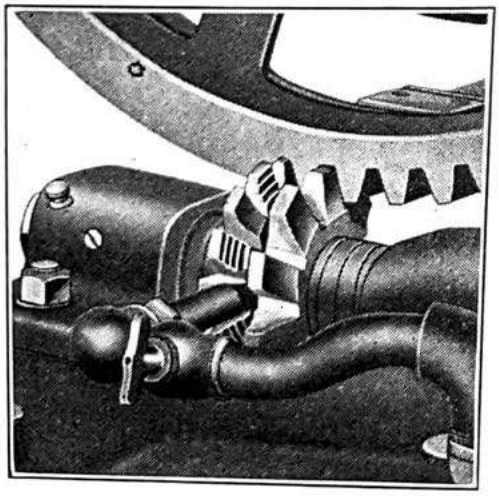
The greater part of the cutting is performed by the plain teeth, the stepped teeth projecting beyond the outline of the plain teeth only enough to break up the chips.

Because of the smooth and easy cutting action, a minimum amount of power is consumed by the machine.

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each, High Speed Steel
*1	8 1-2	2	$151.80
*1 1-4	7 3-4	2	118.30
*1 1-2	7	1 3-4	77.80
1 3-4	6 1-2	1 3-4	60.40
2	5 3-4	1 1-2	44.50
2 1-2	5 3-4	1 1-2	40.00
3	4 3-4	1 1-4	25.10
4	4 1-4	1 1-4	19.20
5	3 3-4	1 1-4	15.50
6	3 1-8	1	12.30
7	2 7-8	1	10.70
8	2 7-8	1	10.20

*Made to order.

Cutters for pitches not given in the above list made to order.
List of Keyways, page 489.



While often used singly to advantage, stocking cutters can also be used many times in combination with a finishing cutter, so that the stocking cutter is roughing out while the finishing cutter is finishing. Many makers of gears find good economy in this "double cutter" method for certain types of work.

Stocking Cutters For Involute Spur Gears

With Undercut Teeth

FOR USE ON BROWN & SHARPE GEAR CUTTING MACHINES HIGH SPEED STEEL

FOR NO. 3 AUTOMATIC GEAR CUTTING MACHINE

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each, High Speed Steel
4	3 5-8	1	$16.40
5	3 3-8	1	14.30
6	3 1-8	1	12.30
7	2 7-8	1	10.70
8	2 7-8	1	10.20

FOR NOS. 4 & 13H AUTOMATIC GEAR CUTTING MACHINES

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each, High Speed Steel
3	4 3-4	1 1-4	$25.10
4	4 1-4	1 1-4	19.20
5	3 3-4	1 1-4	15.50
6	3 1-2	1 1-4	13.40
7	3 3-8	1 1-4	12.60
8	3 1-4	1 1-4	11.10

FOR NO. 5 AUTOMATIC GEAR CUTTING MACHINE

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each, High Speed Steel
2	5 3-4	1 1-2	$44.50
2 1-2	5 3-4	1 1-2	40.00
3	5 1-4	1 1-2	29.00
4	4 1-2	1 1-2	20.70
5	4 1-4	1 1-2	18.00
6	3 7-8	1 1-2	15.70

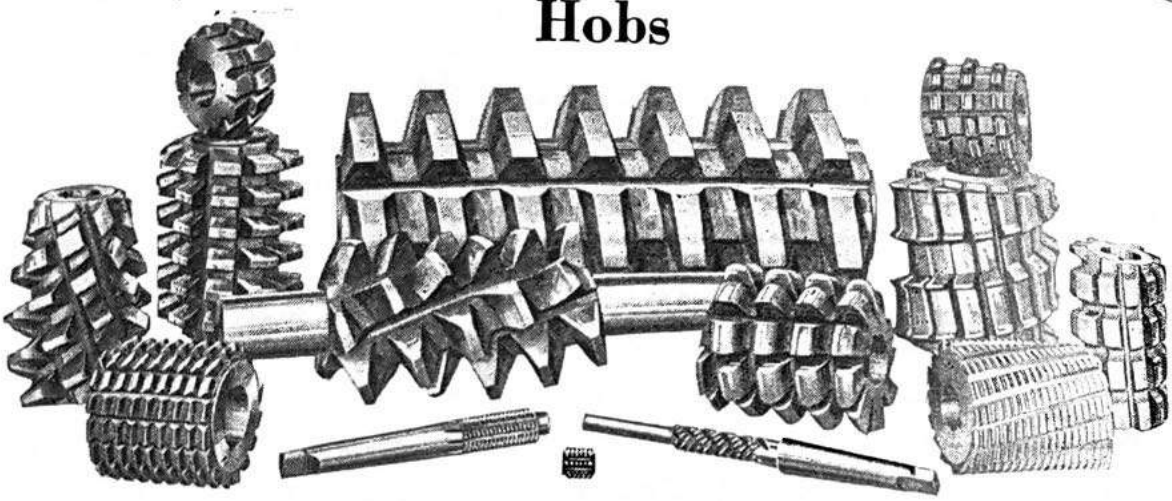
FOR NO. 6 AUTOMATIC GEAR CUTTING MACHINE

Diametral Pitch	Diameter, Inches	Hole, Inches	Price, Each, High Speed Steel
1 3-4	6 1-2	1 3-4	$60.40
2	6 1-2	1 3-4	52.60
2 1-2	6 1-8	1 3-4	47.30
3	5 5-8	1 3-4	35.50
4	4 3-4	1 3-4	22.20
5	4 3-8	1 3-4	19.40

Cutters for pitches not given in the above lists made to order.

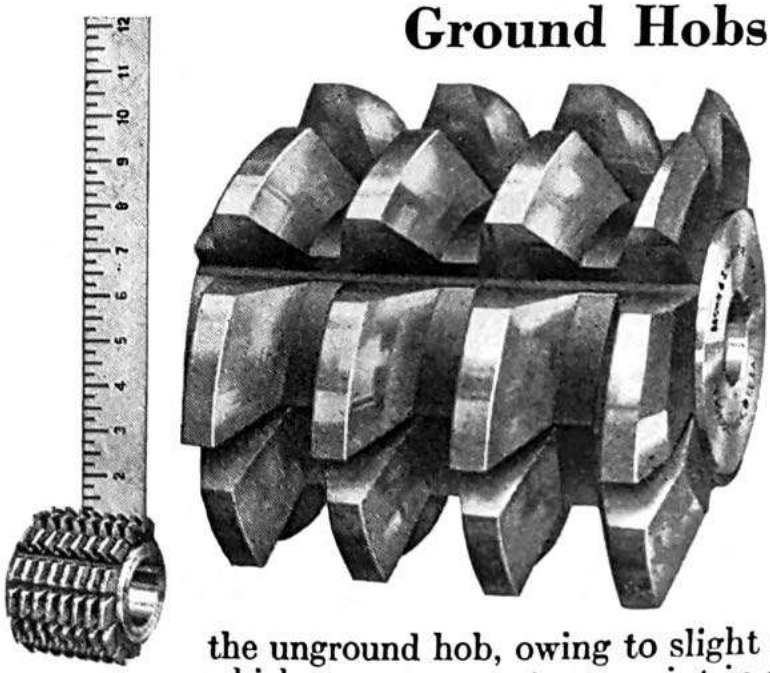
List of Keyways, page 489.

Hobs



Due to our method of relieving the teeth, Brown & Sharpe Hobs cut as freely as milling cutters and are sharpened in the same manner as our formed cutters. The selection and treatment of the steel used in their manufacture are subjects of intensive study and careful investigation. Special machinery enables us to produce hobs for hobbing spur, spiral or helical gears, sprockets and splined shafts as well as hobs for special purposes at short notice.

Ground Hobs



While unground hobs may fill the needs of ordinary practice, we recommend Ground Hobs for best results.

Not only will the gears hobbed with Ground Hobs run more quietly, but the hob can be used from one end to the other without attention other than shifting it endwise. This is not always permissible with the unground hob, owing to slight distortion in hardening which may appear at any point in the unground hob, thus limiting its use.

In grinding the teeth of hobs, not only is the lead corrected, but the cutting edges are made keen with a positive clearance from the cutting edge, which eliminates the danger of rubbing on the sides of the teeth.

Due to this uniformity and keenness, it has frequently been demonstrated that the production per sharpening is greatly increased. Therefore, it is often advisable to use Ground Hobs for roughing operations.

We make it a point to test each hob carefully on a special Hob Testing Machine after grinding.

All our ground hobs are made with short hubs, which are ground true with the hole and the teeth, and serve as points for indicator when testing hobs for true running after mounting and clamping to the hob spindle.

Stub Tooth Gear Hobs

20 Degrees Pressure Angle

HIGH SPEED STEEL

There are several recognized stub tooth gear systems in use. The one most generally used is that in which the proportions of two diametral pitches are used to define the gear.

The coarser or first mentioned pitch is used to determine the pitch diameter, circular pitch and tooth thickness, while the finer pitch determines the tooth depth.

The hobs listed below are of combination pitch, 20 degree pressure angle.

Prices on special hobs of any stub tooth form will be furnished on request.

Diametral Pitch	Outside Diameter, Inches	Length, Inches	Size Hole, Inches	Size Keyway, Inches	Price, Each, High Speed Steel	
					Unground	Ground
3-4	4	4	1 1-4	5-16 x 1-8	$53.80	$76.80
4-5	3 1-2	3 1-2	1 1-4	5-16 x 1-8	40.60	58.50
5-7	3 1-4	3 1-4	1 1-4	5-16 x 1-8	34.80	50.40
6-8	3	3	1 1-4	5-16 x 1-8	29.50	43.40
7-9	3	3	1 1-4	5-16 x 1-8	29.50	42.90
8-10	2 3-4	2 3-4	1 1-4	5-16 x 1-8	27.70	40.00
9-11	2 3-4	2 3-4	1 1-4	5-16 x 1-8	27.70	40.00
10-12	2	2	3-4	1-8 x 1-16	21.40	30.00
10-12	2 3-4	2 3-4	1 1-4	5-16 x 1-8	27.70	39.60
12-14	2	2	3-4	1-8 x 1-16	22.50	31.10
12-14	2 1-2	2 1-2	1 1-4	5-16 x 1-8	27.00	37.80

Carbon Steel Hobs and sizes and dimensions not listed made to order.

Spur Gear Hobs

14½ Degrees Pressure Angle

HIGH SPEED STEEL

The Spur Gear Hobs in the following lists are single threaded and have 14½° pressure angle. In ordering hobs with specifications other than those listed, the following data should be given:

Pitch of gear to be cut
Size of hole and keyway
Whether right- or left-hand
Diameter and length of hob
Whether single or multiple thread
Whether ground or unground
Whether hob should be of carbon or high speed steel

Unless otherwise specified, Spur Gear Hobs are made with 14½° pressure angle and single threaded.

Diametral Pitch	Outside Diameter, Inches	Length, Inches	Size Hole, Inches	Size Keyway, Inches	Price, Each, High Speed Steel Unground
1	10 3-4	15	2 1-2	5-8 x 7-32	$775.20
1 1-4	8 3-4	12	2	1-2 x 3-16	457.30
1 1-2	8	10	2	1-2 x 3-16	333.80
1 3-4	7 1-4	9	2	1-2 x 3-16	260.70
2	5 3-4	8	1 1-2	3-8 x 5-32	168.70
2 1-4	5 1-4	7 1-2	1 1-2	3-8 x 5-32	140.50
2 1-2	5	7	1 1-2	3-8 x 5-32	123.20
2 3-4	4 3-4	6	1 1-2	3-8 x 5-32	99.10

Hobs of Carbon Steel and for pitches not given above made to order.

HIGH SPEED STEEL — 1 1-4 Inch Hole

Diametral Pitch	Outside Diameter, Inches	Length, Inches	Size Keyway, Inches	Price, Each, High Speed Steel	
				Unground	Ground
3	4 1-2	5	5-16 x 1-8	$77.40	$104.80
3 1-2	4 1-4	4 3-4	5-16 x 1-8	68.60	93.10
4	4	4	5-16 x 1-8	53.80	74.30
5	3 1-2	3 1-2	5-16 x 1-8	40.60	57.40
6	3 1-4	3 1-4	5-16 x 1-8	34.80	49.90
7	3	3	5-16 x 1-8	29.50	42.90
8	3	3	5-16 x 1-8	29.50	42.90
9	3	3	5-16 x 1-8	29.50	42.90
10	2 3-4	2 3-4	5-16 x 1-8	27.70	39.60
12	2 3-4	2 3-4	5-16 x 1-8	29.10	41.00
14	2 1-2	2 1-2	5-16 x 1-8	27.00	40.60
16	2 1-2	2 1-2	5-16 x 1-8	27.00	40.60
18	2 1-2	2 1-2	5-16 x 1-8	28.30	45.10
20	2 1-2	2 1-2	5-16 x 1-8	28.30	45.10
22	2 1-2	2	5-16 x 1-8	26.00	44.00
24	2 1-2	2	5-16 x 1-8	27.10	45.10
26	2 1-2	2	5-16 x 1-8	27.10	45.10
28	2 1-2	2	5-16 x 1-8	27.10	48.00
30	2 1-2	2	5-16 x 1-8	29.50	50.40

HIGH SPEED STEEL — 3-4 Inch Hole

Diametral Pitch	Outside Diameter, Inches	Length, Inches	Size Keyway, Inches	Price, Each, High Speed Steel	
				Unground	Ground
10	2 1-16	2	1-8 x 1-16	$22.00	$30.90
12	2	2	1-8 x 1-16	22.50	31.10
14	1 7-8	1 7-8	1-8 x 1-16	21.30	31.50
16	1 7-8	1 7-8	1-8 x 1-16	21.30	31.50
18	1 7-8	1 7-8	1-8 x 1-16	22.30	34.90
20	1 7-8	1 7-8	1-8 x 1-16	22.30	34.90
22	1 7-8	1 7-8	1-8 x 1-16	22.30	37.30
24	1 7-8	1 7-8	1-8 x 1-16	23.30	38.30
26	1 7-8	1 7-8	1-8 x 1-16	23.30	38.30
28	1 7-8	1 7-8	1-8 x 1-16	23.30	40.70
30	1 7-8	1 1-2	1-8 x 1-16	23.10	38.80
32	1 7-8	1 1-2	1-8 x 1-16	23.10	40.90
34	1 7-8	1 1-2	1-8 x 1-16	24.10	41.90
36	1 7-8	1 1-2	1-8 x 1-16	24.10	44.00
38	1 7-8	1 1-2	1-8 x 1-16	24.10	44.00
40	1 7-8	1 1-2	1-8 x 1-16	25.90	45.90
42	1 7-8	1 1-2	1-8 x 1-16	25.90	48.60
44	1 7-8	1 1-2	1-8 x 1-16	25.90	48.60
46	1 7-8	1 1-2	1-8 x 1-16	27.80	53.10
48	1 7-8	1 1-2	1-8 x 1-16	27.80	53.10
50	1 7-8	1 1-2	1-8 x 1-16	27.80	56.10

Hobs of Carbon Steel and for pitches not given above made to order.

Spur Gear Hobs (*Continued*)

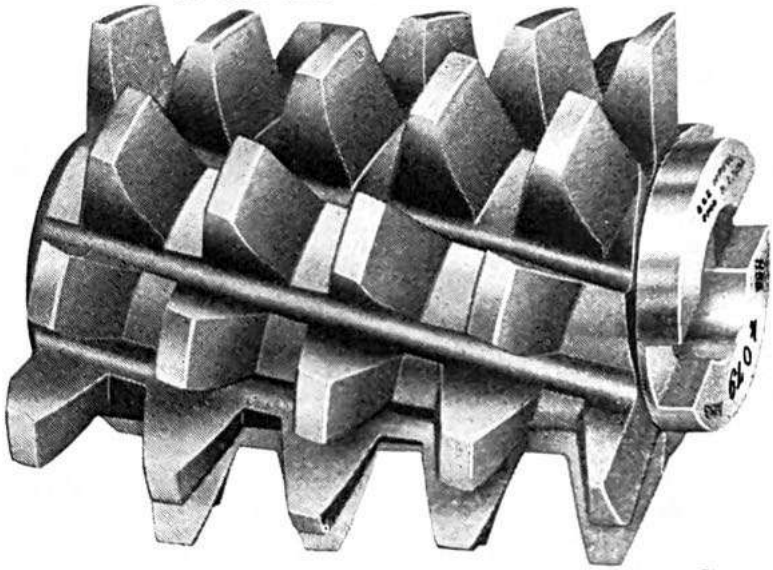
HIGH SPEED STEEL

1-2 Inch Hole

Diametral Pitch	Outside Diameter, Inches	Length, Inches	Size Keyway, Inches	Price, Each High Speed Steel	
				Unground	Ground
24	1 1-4	1 1-4	3-32 x 3-64	**$16.30**	$26.30
26	1 1-4	1 1-4	3-32 x 3-64	**16.30**	26.30
28	1 1-4	1 1-4	3-32 x 3-64	**16.30**	27.90
30	1 1-8	1 1-8	3-32 x 3-64	**16.10**	26.60
32	1 1-8	1 1-8	3-32 x 3-64	**16.10**	28.00
34	1 1-8	1 1-8	3-32 x 3-64	**16.80**	28.70
36	1 1-8	1 1-8	3-32 x 3-64	**16.80**	30.10
38	1 1-8	1 1-8	3-32 x 3-64	**16.80**	30.10
40	1 1-8	1 1-8	3-32 x 3-64	**18.10**	31.40
42	1 1-8	1 1-8	3-32 x 3-64	**18.10**	33.20
44	1 1-8	1 1-8	3-32 x 3-64	**18.10**	33.20
46	1 1-8	1 1-8	3-32 x 3-64	**19.40**	36.30
48	1 1-8	1 1-8	3-32 x 3-64	**19.40**	36.30
50	1 1-8	1 1-8	3-32 x 3-64	**19.40**	38.30

Hobs of Carbon Steel and for pitches not given above made to order.

Worm Gear Hobs



We usually make the outside diameter of Worm Gear Hobs larger than that of the worms by an amount equal to two standard clearances for the pitch in question. To this is also added a sharpening allowance so that the hob will give a reasonable amount of service without having its pitch diameter reduced to less than that of the worm.

Worm Gear Hobs

(Continued)

In ordering Worm Gear Hobs the following paragraphs should be read and the required data given:

Outside diameter and length of worm. Lead. Axial pitch. Number of threads: right- or left-hand. Dimensions of hole and keyway. Whether hob is to be of high speed or carbon steel. Teeth ground or formed. If hob must be made with a taper shank, indicate direction in which hob rotates with respect to the shank end. Give number of teeth in gear and width of face of gear. If the gear is to be rotated by the hob while cutting, this fact should be indicated so that a proper amount of cutting clearance can be provided.

When ordering hobs for gears that mesh with worms which are cut in a lathe, give the included angle of the lathe tool and state whether it is set on the axis or normal to the thread in cutting. As many worms are cut with double angle milling cutters, it will be found that the shape of the space produced will not be the same as the shape of the cutter. This difference in shape may be slight, in the case of single and double thread worms but may become considerable in the case of worms having several threads. Give included angle and diameter of cutter.

Hobs whose threads make an angle of 78 degrees or more with the axis can be made with straight grooves. Such hobs are easy to sharpen. If the hob is to be used extensively in cutting hard bronze, it may be advisable to use spiral grooves, because of the more even cutting action, even though the angle of thread with the axis is considerably larger than 78 degrees, for when made with spiral grooves at right angles to the thread, the cutting action is the same at each cutting edge, whereas, if straight grooves are used, one edge becomes an acute angle, while the other is made somewhat obtuse.

If the nature of the work requires a hob of exact diameter, it should be plainly stated, otherwise the sharpening allowance mentioned above will be added.

The Sizing and Cutting of Gears

Diameter, when applied to gears, is always understood to mean the pitch diameter.

Diametral Pitch is the number of teeth to each inch of the pitch diameter.

Example. If a gear has 40 teeth and the pitch diameter is 4 inches, there are 10 teeth to each inch of the pitch diameter and the diametral pitch is 10, or, in other words, the gear is 10 diametral pitch.

Diametral Pitch required, circular pitch given. Divide 3.1416 by the circular pitch.

Example. If the circular pitch is 2 inches, divide 3.1416 by 2, and the quotient, 1.5708, is the diametral pitch.

Diametral Pitch required, number of teeth and outside diameter given. Add 2 to the number of teeth and divide by the outside diameter.

Example. If the number of teeth is 40, the diameter of the blank is 10½ inches; add 2 to the number of teeth, making 42, and divide by 10½; the quotient, 4, is the diametral pitch.

Circular Pitch is the distance from the center of one tooth to the center of the next, measured along the pitch circle.

Example. If the distance from the center of one tooth to the center of next tooth, measured along the pitch circle, is ½ inch, the gear is ½ inch circular pitch.

Circular Pitch required, diametral pitch given. Divide 3.1416 by the diametral pitch.

Example. If the diametral pitch is 4, divide 3.1416 by 4, and the quotient, .7854 inch, is the circular pitch.

Number of Teeth required, pitch diameter and diametral pitch given. Multiply the pitch diameter by the diametral pitch.

Example. If the diameter of the pitch circle is 10 inches and the diametral pitch is 4, multiply 10 by 4, and the product, 40, will be the number of teeth in the gear.

Number of Teeth required, outside diameter and diametral pitch given. Multiply the outside diameter by the diametral pitch and subtract 2.

Example. If the whole diameter is 10½ inches and the diametral pitch is 4, multiply 10½ by 4, and the product, 42, less 2, or 40, is the number of teeth.

Pitch Diameter required, number of teeth and diametral pitch given. Divide the number of teeth by the diametral pitch.

Example. If the number of teeth is 40 and the diametral pitch is 4, divide 40 by 4, and the quotient, 10, expressed in inches, is the pitch diameter.

Sizing and Cutting of Gears (*Continued*)

Outside Diameter or size of gear blank required, number of teeth and diametral pitch given. Add 2 to the number of teeth and divide by the diametral pitch.

Example. If the number of teeth is 40 and the diametral pitch is 4, add 2 to the 40, making 42, and divide by 4; the quotient, 10½, is the whole diameter of the gear or blank.

Thickness of Tooth at Pitch Line required. Divide the circular pitch by 2, or 1.57 by the diametral pitch.

Example. If the circular pitch is 1.047 inches, or the diametral pitch is 3, divide 1.047 by 2, or 1.57 by 3, and the quotient, .523 inch, is the thickness of tooth.

Whole Depth of Tooth required. Divide 2.157 by the diametral pitch.

Example. If the diametral pitch of a gear is 6, the whole depth is 2.157 divided by 6, which equals .3595.

Whole Depth of Tooth is about 11-16 or exactly .6866 of the circular pitch.

Example. If the circular pitch is 2 inches, the whole depth of tooth is .6866 × 2 inches, or 1⅜ inches nearly.

Distance between Centers of two gears required. Add the number of teeth together and divide one half the sum by the diametral pitch.

Example. If two gears have 50 and 30 teeth, respectively, and are 5 pitch, add 50 and 30, making 80, divide by 2, and then divide the quotient, 40, by the diametral pitch, 5, and the result, 8 inches, is the center distance.

Measurement of Gears

We call attention to the following tools that have been developed by us to facilitate measurements in connection with the cutting and sizing of gears:

Gear Tooth Verniers Nos. 580 and 581, for accurately measuring the thickness at pitch line or the chordal thickness of gear teeth and the distance from top of tooth to the chord.

Depth of Gear Tooth Micrometer No. 249, for scribing a line on gear blanks to indicate accurately the extreme depth to cut the teeth.

Corresponding Circular and Diametral Pitches

Table No. 1 shows the diametral pitches with the corresponding circular pitches.

Table No. 2 shows the circular pitches with the corresponding diametral pitches.

Table No. 1

Diametral Pitch	Circular Pitch, Inches	Diametral Pitch	Circular Pitch, Inches
1 1-4	2.5133	11	.286
1 1-2	2.0944	12	.262
1 3-4	1.7952	14	.224
2	1.571	16	.196
2 1-4	1.396	18	.175
2 1-2	1.257	20	.157
2 3-4	1.142	22	.143
3	1.047	24	.131
3 1-2	.898	26	.121
4	.785	28	.112
5	.628	30	.105
6	.524	32	.098
7	.449	36	.087
8	.393	40	.079
9	.349	48	.065
10	.314	..	...

Table No. 2

Circular Pitch, Inches	Diametral Pitch	Circular Pitch, Inches	Diametral Pitch
2	1.571	3-4	4.189
1 7-8	1.676	11-16	4.570
1 3-4	1.795	5-8	5.027
1 5-8	1.933	9-16	5.585
1 1-2	2.094	1-2	6.283
1 7-16	2.185	7-16	7.181
1 3-8	2.285	3-8	8.378
1 5-16	2.394	5-16	10.053
1 1-4	2.513	1-4	12.566
1 3-16	2.646	3-16	16.755
1 1-8	2.793	1-8	25.133
1 1-16	2.957	1-16	50.266
1	3.142	...	...
15-16	3.351	...	...
7-8	3.590	...	...
13-16	3.867	...	...

According to the system adopted by the Brown & Sharpe Mfg. Co., any gear of one pitch will gear into any other gear or into a rack of the same pitch. Eight cutters are required for each pitch. These eight cutters are adapted to cut from a pinion of twelve teeth to a rack, and are numbered respectively, 1, 2, 3, etc. The number of teeth and the pitch for which a cutter is adapted are also marked on each.

No.	1	will	cut	gears	from	135	teeth	to	a rack
"	2	"	"	"	"	55	to	134	teeth
"	3	"	"	"	"	35	"	54	"
"	4	"	"	"	"	26	"	34	"
"	5	"	"	"	"	21	"	25	"
"	6	"	"	"	"	17	"	20	"
"	7	"	"	"	"	14	"	16	"
"	8	"	"	"	"	12	"	13	"

If a cutter is wanted for a gear of 40 teeth of 8 pitch, then the cutter required would be No. 3 of 8 pitch, inasmuch as a No. 3 cutter will cut all gears containing from 35 to 54 teeth, inclusive. Since 40 occurs between those numbers, No. 3 is the one desired. It should be borne in mind that eight different cutters are required in order to cut all the gears of any given pitch. Directions for the use of these cutters will be found on pages 499 and 501.

Cutters should be kept sharp.

It is desirable in applying gearing of any kind, to avoid having gears or pinions with a small number of teeth. Pinions of twelve teeth will work very well, but fewer teeth should not be used.

Few mechanics are familiar with the formulas and details of gearing and the necessity for exact sizing of gears, as to diameter, is often overlooked. Special care is required also to know that the distance of the centers of two gears running together is correct relatively to the diameters.

Depth of Space and Thickness of Tooth in Spur Gears, when Cut with Our Gear Cutters

Pitch of Cutter	Depth to be Cut in Gear, Inches	Thickness of Tooth at Pitch Line, Inches	Pitch of Cutter	Depth to be Cut in Gear, Inches	Thickness of Tooth at Pitch Line, Inches
1 1-4	1.726	1.257	11	.196	.143
1 1-2	1.438	1.047	12	.180	.131
1 3-4	1.233	.898	14	.154	.112
2	1.079	.785	16	.135	.098
2 1-4	.959	.698	18	.120	.087
2 1-2	.863	.628	20	.108	.079
2 3-4	.784	.571	22	.098	.071
3	.719	.524	24	.090	.065
3 1-2	.616	.449	26	.083	.060
4	.539	.393	28	.077	.056
5	.431	.314	30	.072	.052
6	.360	.262	32	.067	.049
7	.308	.224	36	.060	.044
8	.270	.196	40	.054	.039
9	.240	.175	48	.045	.033
10	.216	.157	..	...	...

Comparative Sizes of Gear Teeth

INVOLUTE

20 P

18 P

16 P

14 P

12 P

10 P

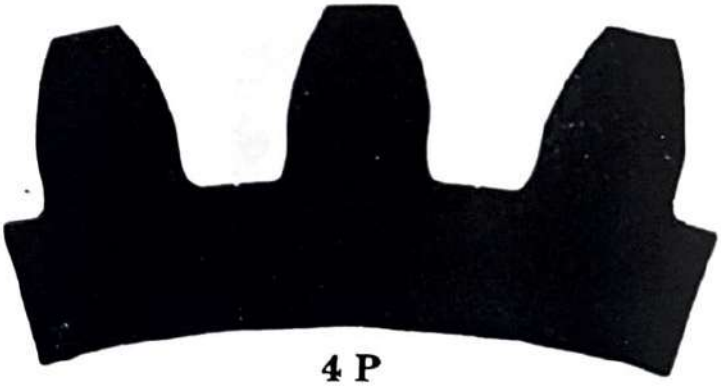
9 P

8 P

7 P

6 P

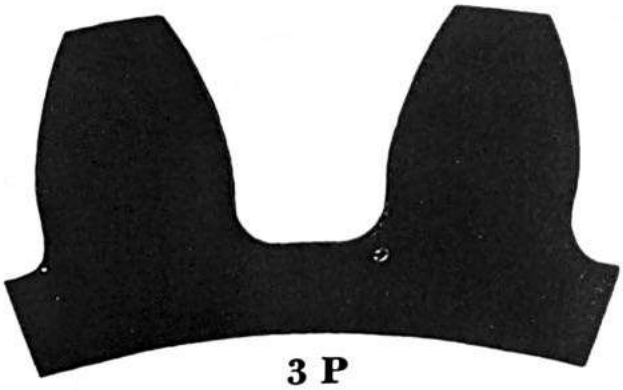
5 P



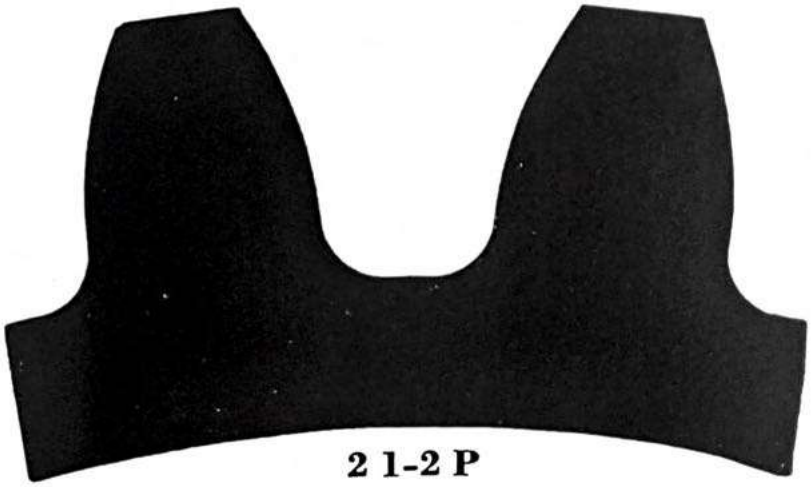
4 P

Comparative Sizes of Gear Teeth

INVOLUTE (*Continued*)



3 P



2 1-2 P

2 P

Formulas for Determining the Dimensions of Gears by Diametral Pitch

Let P denote the diametral pitch, or the number of teeth to one inch of diameter of pitch circle.

"	D'	"	"	diameter of pitch circle.
"	D	"	"	whole diameter.
"	D'''	"	"	bottom diameter.
"	N	"	"	number of teeth.
"	V	"	"	velocity.
"	d'	"	"	diameter of circle.
"	d	"	"	whole diameter.
"	d'''	"	"	bottom diameter.
"	n	"	"	number of teeth.
"	v	"	"	velocity.

Larger Gear

Smaller Gear

These gears run together

" a " " distance between the centers of the two gears.

" b " " number of teeth in both gears.

" t " " thickness of tooth or cutter on pitch circle.

" D'' " " working depth of tooth.

" f " " amount added to depth of tooth for rounding the corners and for clearance.

" $D'' + f$ denote the whole depth of tooth.

" π denote the constant 3.1416.

" P' denote the circular pitch or the distance from the center of one tooth to the center of the next on the pitch circle.

The examples placed opposite the formulas on the two pages following are for a single gear of 12 pitch, 6.166 in. or 6 $\frac{2}{12}$ in. diameter, etc., and in the case of the two gears the larger has the same dimensions. The velocities are respectively 1 and 2.

Formulas for Determining the Dimensions of Gears by Diametral Pitch for a Single Gear

Formulas. *Examples.*

$$P = \frac{N + 2}{D} = \frac{72 + 2}{6.166}, \text{ or } \frac{72 + 2}{6\frac{2}{12}} = 12. \quad \ldots \quad 1$$

$$P = \frac{N}{D'} = \frac{72}{6} = 12 \quad \ldots \quad 2$$

$$D' = \frac{D \times N}{N + 2} = \frac{6.166 \times 72}{72 + 2} = 6 \quad \ldots \quad 3$$

$$D' = \frac{N}{P} = \frac{72}{12} = 6 \quad \ldots \quad 4$$

$$N = P\,D' = 12 \times 6 = 72 \quad \ldots \quad 5$$

$$N = P\,D - 2 = (12 \times 6.166) - 2, \text{ or } (12 \times 6\tfrac{2}{12}) - 2 = 72 \quad \ldots \quad 6$$

$$D = \frac{N + 2}{P} = \frac{72 + 2}{12} = 6.166, \text{ or } 6\tfrac{2}{12} \quad \ldots \quad 7$$

$$D = D' + \frac{2}{P} = 6 + \frac{2}{12}, \text{ or } 6 + .166 = 6.166 \quad \ldots \quad 8$$

$$D''' = \frac{N - 2.314}{P} = \frac{72 - 2.314}{12} = 5.807 \quad \ldots \quad 9$$

$$D''' = D - 2\,(D'' + f) = 6.166 - .3596 = 5.807 \quad \ldots \quad 10$$

$$t = \frac{1.57}{P} = \frac{1.57}{12} = .130 \quad \ldots \quad 11$$

$$D'' = \frac{2}{P} = \frac{2}{12} = .166, \text{ or } \tfrac{2}{12} \quad \ldots \quad 12$$

$$f = \frac{t}{10} = \frac{.130}{10} = .013 \quad \ldots \quad 13$$

$$D'' + f = .166 + .013 = .179 \quad \ldots \quad 14$$

$$P' = \frac{\pi}{P} = \frac{3.1416}{12} = .262 \quad \ldots \quad 15$$

$$P = \frac{\pi}{P'} = \frac{3.1416}{.262} = 12 \quad \ldots \quad 16$$

Formulas for Determining the Dimensions of Gears by Diametral Pitch for a Pair of Gears

Formulas. *Examples.*

$b = 2\,a\,P = 2 \times 4.5 \times 12 = 108$ 17

$n = \frac{b\,V}{v + V} = \frac{108 \times 1}{3} = 36$ 18

$N = \frac{n\,v}{V} = \frac{36 \times 2}{1} = 72$ 19

$n = \frac{N\,V}{v} = \frac{72 \times 1}{2} = 36$ 20

$N = \frac{b\,v}{v + V} = \frac{108 \times 2}{3} = 72$ 21

$n = \frac{P\,D'V}{v} = \frac{12 \times 6 \times 1}{2} = 36$ 22

$V = \frac{n\,v}{N} = \frac{36 \times 2}{72} = 1$ 23

$v = \frac{N\,V}{n} = \frac{72 \times 1}{36} = 2$ 24

$v = \frac{P\,D'V}{n} = \frac{12 \times 6 \times 1}{36} = 2$ 25

$D = \frac{2\,a(N + 2)}{b} = \frac{2 \times 4.5 \times (72 + 2)}{108} = 6.166$ 26

$d = \frac{2\,a(n + 2)}{b} = \frac{2 \times 4.5 \times (36 + 2)}{108} = 3.166$ 27

$a = \frac{b}{2\,P} = \frac{108}{2 \times 12} = 4.5$ 28

$D' = \frac{2\,a\,v}{v + V} = \frac{2 \times 4.5 \times 2}{3} = 6$ 29

$d' = \frac{2\,a\,V}{v + V} = \frac{2 \times 4.5 \times 1}{3} = 3$ 30

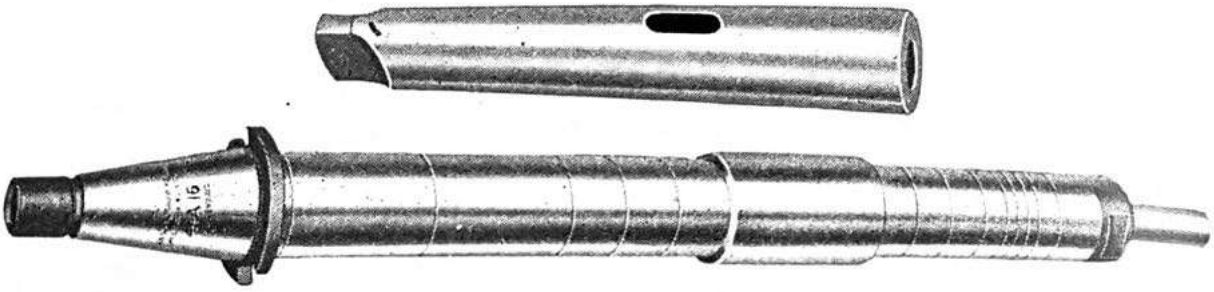
$a = \frac{D' + d'}{2} = \frac{6 + 3}{2} = 4.5$ 31

Arbors, Collets and Adapters

B·S

Brown & Sharpe Arbors, Collets and Adapters Permit Full Machine and Cutter Capacity

Features of Brown & Sharpe Arbors and Collets



Made of special steel which experience shows best suited for the requirements and heat treated to secure the greatest toughness and durability. Tapers are ground and fit spindle end accurately. Threads are ground for accurate fit of nut on arbor, and collet holes are accurately reamed.

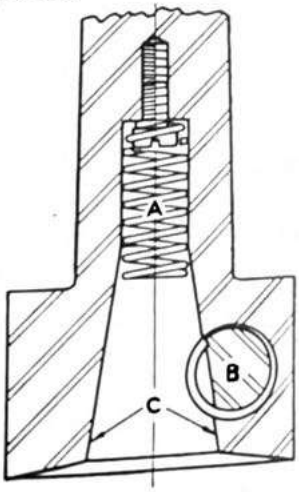
They insure accurate running cutting tools and efficient transmission of power.

Advantages of Brown & Sharpe "Cam Lock"

For Cutters, Arbors and Adapters

This patented Cam Lock is used exclusively on several Brown & Sharpe Adapters (Pages 546 to 548) for holding cutters, arbors and other adapters. It provides quick insertion and removal and positive drive. The locking cam engages groove in cutter or adapter shank and draws shank securely to a seat.

Where End Milling Jobs require frequent cutter change, the "Cam Lock" saves much time. There is no fussing with a "sticking" End Mill. A turn of the wrench and mill is released; a new mill is as simply inserted.



A Spring keeps End Mill floating and insures correct seating.

B Cam lock insures positive drive. Draws mill securely into taper—locks it there.

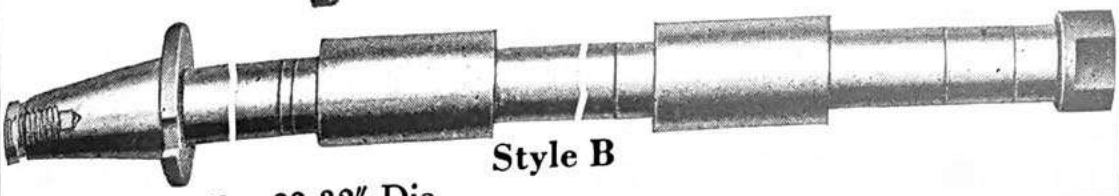
C Milling Machine Standard Taper insures quick release.

Cutter Arbors

For use on Milling Machines having Standardized Spindle End

Patented

Style A



Style B

Style A has pilot 23-32″ Dia.

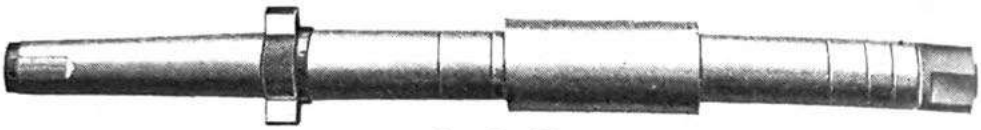
No. of Arbor	For use with Spindles having M.M. Std. Taper Hole No.	Diam. of Arbor, Inches	Length Shoulder to Nut, Inches	Diam. Hard. Sleeve, Inches	Style	Sleeves Furnished	Threaded Hole	Price
40⅞A10	40	7-8	10	....	*A	0	5-8″ 11 N. C., R. H.	$29.00
41 A12	40	1	12	....	*A	0		33.00
41¼A12	40	1 1-4	12	....	*A	0		35.00
41 A16-3	40	1	16	1 7-8	A	1		37.50
41¼A16-3	40	1 1-4	16	1 7-8	A	1		39.50
50⅞A10	50	7-8	10	....	*A	0		29.00
51 A12	50	1	12	....	*A	0		33.00
51¼A12	50	1 1-4	12	....	*A	0		35.00
51 A18-4	50	1	18	2 1-8	A	1		41.00
51¼A18-4	50	1 1-4	18	2 1-8	A	1		44.00
51 B15-4	50	1	15	2 1-8	**B	1		38.00
51¼B15-4	50	1 1-4	15	2 1-8	**B	1		41.00
51½B15-4	50	1 1-2	15	2 1-8	**B	1		44.00
51½B18-4	50	1 1-2	18	2 1-8	B	2	1″ 8 N. C., R. H.	51.00
51 B24-4	50	1	24	2 1-8	B	2		50.00
51¼B24-4	50	1 1-4	24	2 1-8	B	2		53.00
51½B24-4	50	1 1-2	24	2 1-8	B	2		59.00
51 B24-5	50	1	24	2 3-4	B	2		51.00
51¼B24-5	50	1 1-4	24	2 3-4	B	2		54.00
51½B24-5	50	1 1-2	24	2 3-4	B	2		61.00
51½B30-5	50	1 1-2	30	2 3-4	B	2		69.00
51½B36-5	50	1 1-2	36	2 3-4	B	2		80.00
52 B24-5	50	2	24	2 3-4	B	2		77.00
52 B30-5	50	2	30	2 3-4	B	2		86.00
52 B36-5	50	2	36	2 3-4	B	2		97.00

*Differs from cut in that no sleeve is furnished. **Has one sleeve only.

Milling Machine Standard Tapers, page 656. For Hardened Sleeves, see page 536.

Cutter Arbors

For use on Brown & Sharpe Milling Machines having Taper-Nose Spindle



Style F

Style G

No. of Arbor	No. of Taper Shank	Diam. of Arbor, Inches	Length Shoulder to Nut, Inches	Diam. of Hardened Sleeve, Inches	Style	Sleeves Furnished	Threaded Hole	Price
501	10	7-8	12	1 13-16	F	1	1-2″ 14 L. H.	$27.50
502	10	1	12	1 13-16	F			27.50
504	10	7-8	17	1 13-16	F			29.00
505	10	1	17	1 13-16	F			29.00
506	10	1 1-4	17	1 13-16	F			29.00
505A	10	1	17	1 13-16	G			33.00
506A	10	1 1-4	17	1 13-16	G			33.00
511	11	1	16 1-4	2 1-16	G	2	3-4″ 12 L. H.	33.00
512	11	1 1-4	19 3-4	2 1-16	G			35.00
513	11	1 1-2	19 3-4	2 1-16	G			35.00
515	11	1	22	2 1-16	G			40.00
516	11	1 1-4	26	2 1-16	G			42.00
517	11	1 1-2	26	2 1-16	G			42.00
520	12	1	22	2 5-16	G			42.00
521	12	1 1-4	26 3-4	2 5-16	G			45.00
522	12	1 1-2	26 3-4	2 5-16	G			45.00
530	14	1	25	2 9-16	G		1″ 10 L. H.	48.00
531	14	1 1-4	29	2 9-16	G			50.00
532	14	1 1-2	29	2 9-16	G			50.00
534	14	2	29	2 9-16	G			55.00
535	14	1	30	2 9-16	G			55.00
537	14	1 1-2	35	2 9-16	G			60.00
539	14	2	35	2 9-16	G			65.00

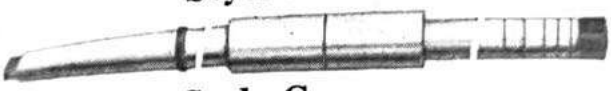
Brown & Sharpe Tapers, pages 654 to 656.

Cutter Arbors

For use on Brown & Sharpe Milling Machines having Threaded-Nose Spindle

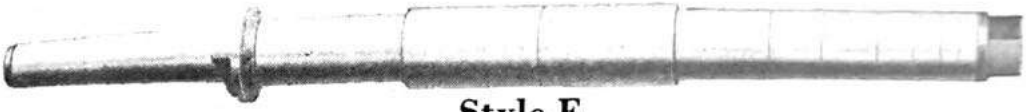
Style A

Style B



Style C

Style D



Style E

No. of Arbor	No. of Taper Shank	Diam. of Arbor, Inches	Length Shoulder to Nut, Inches	Diam. of Hardened Sleeve, Inches	Sleeves Furnished	Style	Price
05	7	1-2	3	....		A	$8.00
07	9	5-8	4	....		A	9.00
08	9	7-8	5 1-4	....		A	9.75
09	9	1	5 1-4	....	0	A	9.75
010	9	5-8	8	....		A	13.00
011	9	7-8	8	....		A	13.00
012	9	1	8	....		A	13.00
013	9	1	12	1 13-16	1	B	21.00
1	10	5-8	4	....		A	9.75
6	10	7-8	5 1-4	....		A	12.00
7	10	1	5 1-4	....		A	12.00
9	10	1 1-4	5 1-4	....	0	A	12.00
10	10	7-8	8	....		A	15.00
11	10	1	8	....		A	15.00
13	10	1 1-4	8	....		A	15.00
40	10	7-8	12	1 13-16		B	23.00
41	10	1	12	1 13-16		B	23.00
43	10	1 1-4	12	1 13-16		B	23.00
44	10	7-8	17	1 13-16	1	B	24.00
45	10	1	17	1 13-16		B	24.00
47	10	1 1-4	17	1 13-16		B	24.00
53	10	1	14 1-2	1 13-16		D	25.00
55	10	1 1-4	14 1-2	1 13-16		D	25.00
15	11	7-8	10 1-4	....	0	A	18.00
16	11	1	10 1-4	....		A	18.00

Brown & Sharpe Tapers, pages 654 to 656.
List continued on next page.

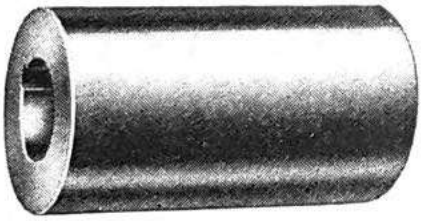
Cutter Arbors (*Continued*)

No. of Arbor	No. of Taper Shank	Diam. of Arbor, Inches	Length Shoulder to Nut, Inches	Diam. of Hardened Sleeve, Inches	Sleeves Furnished	Style	Price
49–A	11	1	18	2 1-16	2	C	$30.50
35–A	11	7-8	16 1-4	2 1-16		E	33.00
36–A	11	1	16 1-4	2 1-16		E	33.00
38–A	11	1 1-4	19 3-4	2 1-16		E	35.00
39–A	11	1 1-2	19 3-4	2 1-16		E	35.00
65–A	11	1	22	2 5-16		E	37.00
66–A	11	1 1-4	26 3-4	2 5-16		E	39.50
67–A	11	1 1-2	26 3-4	2 5-16		E	39.50
70–A	12	1 1-4	29	2 9-16		E	39.50
71–A	12	1 1-2	29	2 9-16		E	39.50
77–A	12	1 1-2	35	2 9-16		E	49.50
79–A	12	2	35	2 9-16		E	49.50

Brown & Sharpe Tapers, pages 654 to 656.

Hardened Steel Sleeves

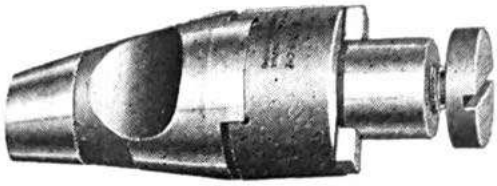
For Arbors Used on Milling Machines having Standardized Spindle End

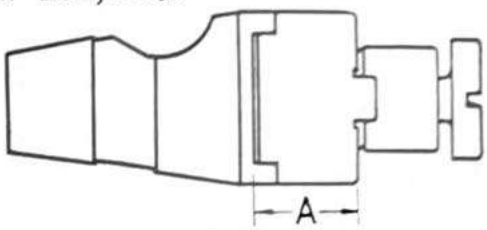


No. of Sleeve	Diam. Sleeve, Inches	Diam. Hole, Inches	Length, Inches	Price
3	1 7-8	1	3 1-8	$4.00
3	1 7-8	1 1-4	3 1-8	4.00
4	2 1-8	1	3 3-4	4.00
4	2 1-8	1 1-4	3 3-4	4.00
4	2 1-8	1 1-2	3 3-4	5.00
5	2 3-4	1	4 1-4	5.00
5	2 3-4	1 1-4	4 1-4	5.00
5	2 3-4	1 1-2	4 1-4	5.00
5	2 3-4	2	4 1-4	

Arbors for Shell End Mills

For Use with Cutter Adapters with *Cam Lock having No. 30 Milling Machine Standard Taper Hole and With Shell End Mills Nos. F-225 to F-232, inc.



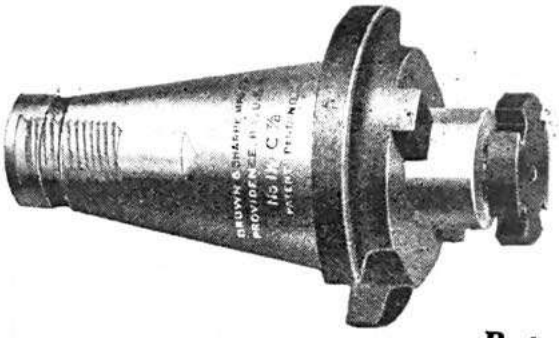


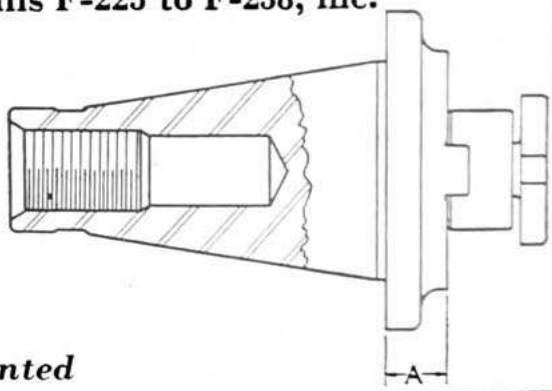
No.	For use with Adapters having M. M. Std. Taper Hole. No.	Diam. of Hole in End Mill, Inches	A, Inches	Price
30½-C-⅞	30	1-2	7-8	$15.00
30¾-C-⅞	30	3-4	7-8	15.00
31 -C-⅞	30	1	7-8	15.00

*See page 532.

Arbors for Shell End Mills

For Use on Milling Machines having Standardized Spindle End and With Shell End Mills F-225 to F-238, inc.





Patented

No.	For use with Spindles having M. M. Std. Taper Hole, No.	Diam. of Hole in End Mill, Inches	A, Inches	Threaded Hole	Price
40½-C-⅝	40	1-2	5-8	5-8" 11 N. C., R. H.	$20.00
40¾-C-⅝	40	3-4	5-8		20.00
41 -C-⅞	40	1	7-8		20.00
41¼-C-⅞	40	1 1-4	7-8		20.00
41½-C-⅞	40	1 1-2	7-8		20.00
50½-C-⅝	50	1-2	5-8	1" 8 N. C., R. H.	30.00
50¾-C-⅝	50	3-4	5-8		30.00
51 -C-⅞	50	1	7-8		26.00
51¼-C-⅞	50	1 1-4	7-8		26.00
51½-C-⅞	50	1 1-2	7-8		26.00
52 -C-⅞	50	2	7-8		26.00

Milling Machine Standard Tapers, page 650.

Arbors for Shell End Mills

For Use with Shell End Mills F-225 to F-238, inclusive.

Style A for Use with Adapters on Milling Machines having Standardized Spindle End and Style B with Vertical Milling Attachments having No. 9 Brown & Sharpe Taper Hole.

Style A

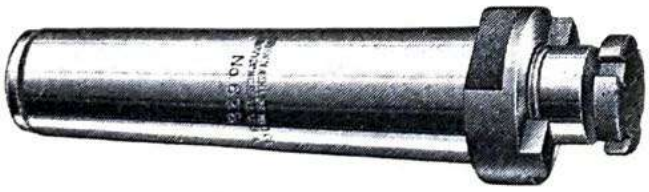
Style B

No.	No. of Taper Shank	Dia. Hole in End Mill, Inches	Style	Threaded Hole	Price
600A	7	1-2	A	.....	$15.00
601A	9	1-2	A	.....	16.00
601B	9	1-2	B	7-16″ 14 L. H.	16.00
602A	9	3-4	A	.....	18.00
602B	9	3-4	B	7-16″ 14 L. H.	18.00
603A	9	1	A	.....	18.00
603B	9	1	B	7-16″ 14 L. H.	18.00
604A	10	1 1-4	A	.....	20.00

For Use on Brown & Sharpe Milling Machines having Taper-Nose Spindle.

No.	No. Taper Shank	Diam. Hole, End Mill, Inches	Threaded Hole	Price
611	10	3-4	1-2″ 14 L. H.	$18.00
612	10	1		20.00
613	10	1 1-4		23.00
614	11	1 1-4		25.00
615	12	1 1-4	3-4″ 12 L. H.	27.00
616	11	1 1-2		30.00
617	12	1 1-2		30.00
618	12	2		33.00

For Use on Brown & Sharpe Milling Machines having Threaded-Nose Spindle.



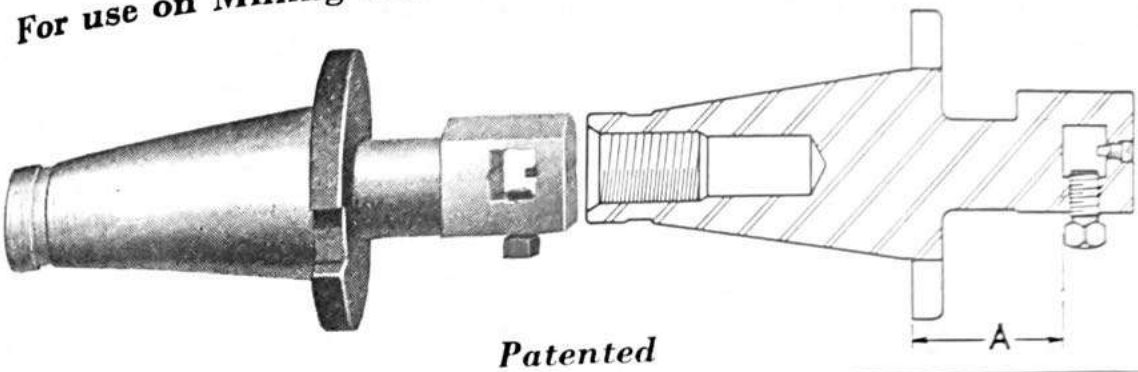
No.	No. Taper Shank	Diam. Hole, End Mill, Inches	Price
*619	10	3-4	$20.00
*620	10	1	20.00
621	11	1 1-4	23.00
622	12	1 1-4	23.00
623	11	1 1-2	25.00
624	12	1 1-2	25.00
625	12	2	28.00

*Has tang end; does not have driving collar.

Brown & Sharpe Tapers, pages 654 to 656.

Fly Cutter Arbors

For use on Milling Machines having Standardized Spindle End



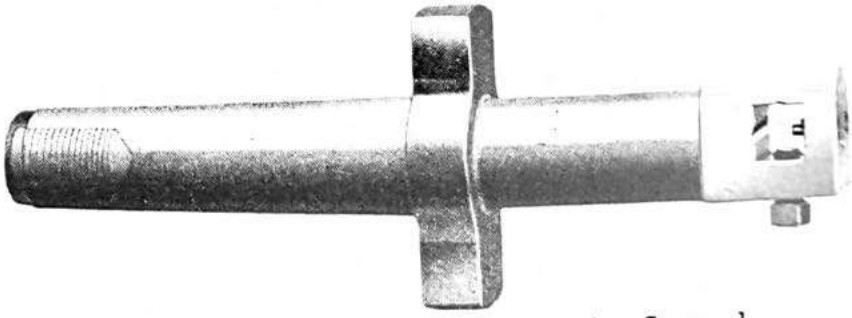
Patented

No.	For Spindles having M. M. Std. Taper Hole, No.	A, Inches	Square Hole, Size, Inches	Threaded Hole	Price
40	40	3 1-32	3-4	5-8″ 11 N. C., R. H.	$28.50
50	50	2 17-32	3-4	1″ 8 N. C., R. H.	28.50

Prices include tool with 1-8″ radius.

Fly Cutter Arbors

For use on Brown & Sharpe Milling Machines having Taper-Nose Spindle



Has 3-4″ square hole in head for fly tool.

No.	No. of Taper Shank	Threaded Hole	Milling Machines where used	Price
590	10	1-2″ 14 L. H.	*1-*1A-2-2A Univ.; *1-1B-2-2B Pl.; 21 Auto.	$22.00
591	11	3-4″ 12 L. H.	3-3A Univ.; 3-3B-13B Pl.; 2-5 Vert. Sp.; 33 Auto.	25.50

*With or without Back Gears.

Price includes tool with 1-8″ radius.

Milling Machine Standard and Brown & Sharpe Tapers, pages 654 to 656.

Fly Cutter Arbors

For use on Brown & Sharpe Milling Machines having Threaded-Nose Spindle

Has 3-4″ square hole in head for fly tool.

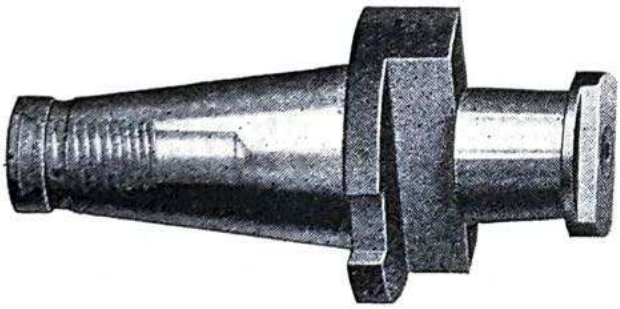
No.	No. of Taper Shank	Price
110	10	$11.75
112	11	14.75

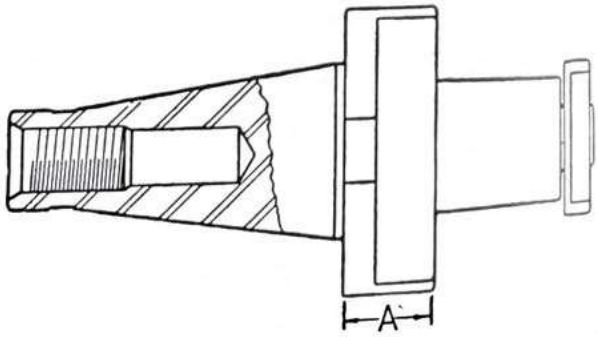
Price includes tool with 1-8″ radius.

Arbor for Face Milling Cutters

Patented

For use on Milling Machines having Standardized Spindle End with Face Milling Cutters Nos. A-101, A-103 and A-106



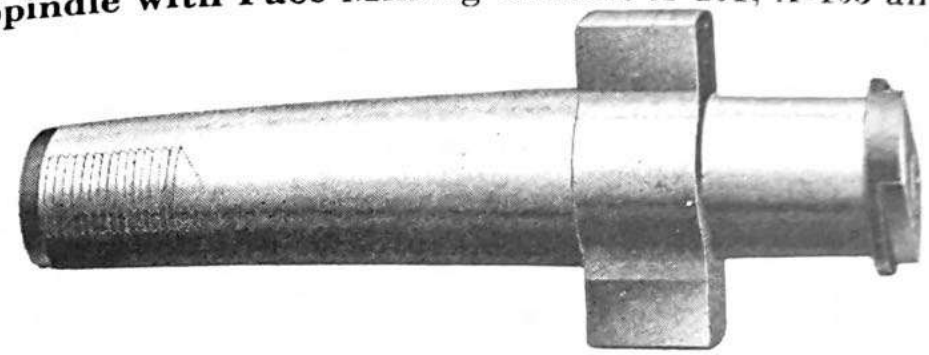


No.	For Spindles having M. M. Std. Taper Hole, No.	For Face Milling Cutters, Nos.	Threaded Hole	A, Inches	Price
50	50	A-101, A-103 and A-106	1″ 8 N. C., R. H.	1 7-16	$40.00

Milling Machine Standard and Brown & Sharpe Tapers, pages 654 to 656.

Arbors for Face Milling Cutters

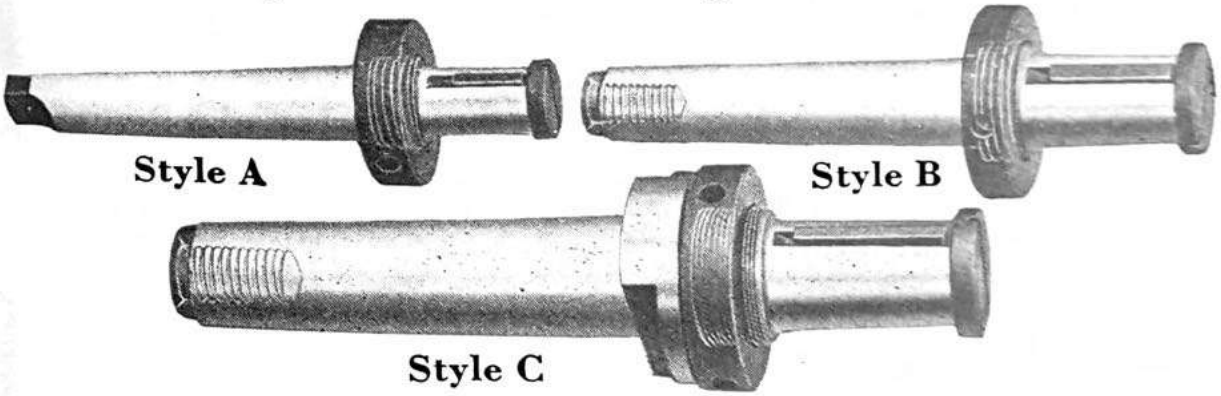
For use on Brown & Sharpe Milling Machines having Taper-Nose Spindle with Face Milling Cutters A-101, A-103 and A-106



No. of Arbor	No. Taper Shank	For Face Milling Cutters, No.	Threaded Hole	Milling Machines where used	Price
580	10	A-101 A-103 A-106	1-2″ 14 L. H.	*1-*1A-2-2A Univ.; *1-*1B-2-2B Pl.; 21 Auto.	$20.00
581	11		3-4″ 12 L. H.	3-3A Univ.; 3-3B-13 B Pl.; 2-5 Vert. Sp.; 33 Auto.	20.00

*With or without Back Gears.

For use on Brown & Sharpe Milling Machines having Threaded-Nose Spindle with Face Milling Cutters A-1 to A-8



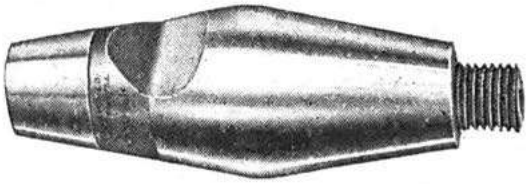
Style D. Similar to Style C, but no threaded hole.

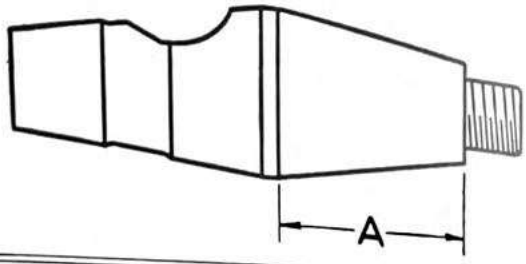
No. of Arbor	No. of Taper of Shank	No. of Taper for Mill	Style	Threaded Hole	Price
79	10	10	A	.....	$14.00
82	11	12	A	.....	18.00
81	11	12	B	3-4″ 12 L. H.	18.00
80	11	10	C		21.50
83	11	12	C		21.50
87	12	12	C		21.50

Brown & Sharpe Tapers, pages 654 to 656.

Screw Arbors

For use with Cutter Adapters with *Cam Lock having No. 30 Milling Machine Standard Taper Hole





No.	For use with Adapters having M. M. Std. Taper Hole, No.	For Cutters with Threaded Hole	A, Inches	Price
30⅜-24	30	3-8″ 24, N. F., L. H.	1 1-2	$5.00
30½-20	30	1-2″ 20, N. F., L. H.	1 1-2	5.00

Arbors with Right-Hand Thread can be furnished to order at short notice. Price on application.

*See page 532.

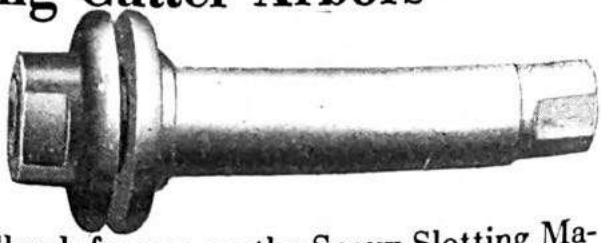
Screw Arbors

For use on Brown & Sharpe Milling Machines having Threaded-Nose Spindle

No.	Number of Taper Shank	For Cutters with Threaded Hole	Price
220	7	3-8″ 24, N. F., L. H.	$3.75
222	9	1-2″ 20, N. F., L. H.	5.00

Arbors with Right-Hand Thread can be furnished to order at short notice. Price on application.

Screw Slotting Cutter Arbors



Adapted for use on Centers. Made for cutters with holes of the following diameters: 1-2″, 5-8″, 3-4″, 1″.

Price each, **$7.50**

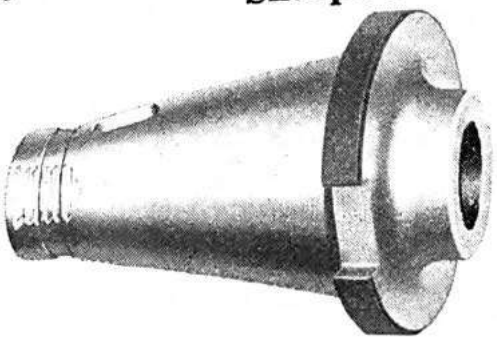
Also made to order with No. 7 Brown & Sharpe Taper Shank for use on the Screw Slotting Machine and can be furnished at short notice.

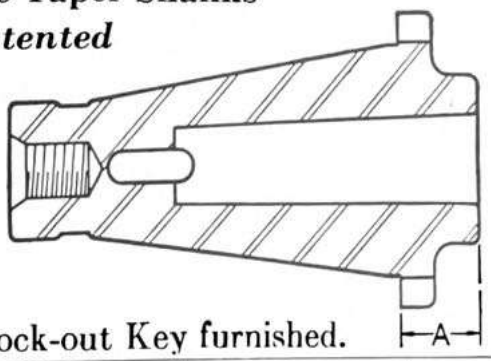
Milling Machine Standard and Brown & Sharpe Tapers, pages 654 to 656.

Adapters

For use on Milling Machines having Standardized Spindle End to accommodate Arbors, End Mills, etc., having Brown & Sharpe and Morse Taper Shanks

Patented





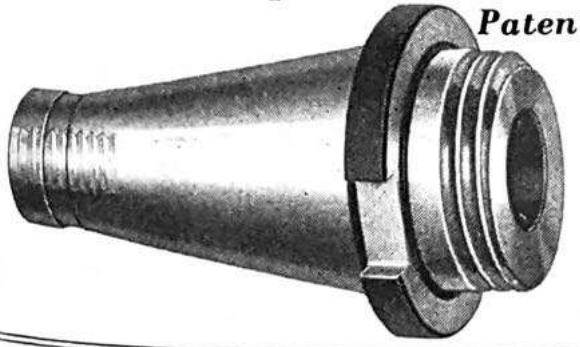
Knock-out Key furnished.

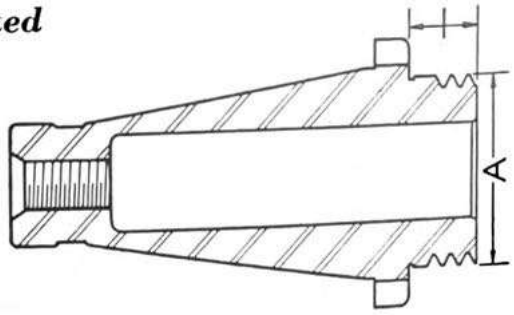
No.	For Spindles with M. M. Std. Taper Hole, No.	For Arbors, End Mills, etc., having Taper Shank, No.	A, Inches	Threaded Hole	Price
43M	40	3 Morse	1 11-16		$16.50
45	40	5 B&S	2 7-16	7-16″ 14	16.50
47	40	7 B&S	1 11-16	N. C., R. H.	16.50
49	40	9 B&S	2 9-16		16.50
54M	50	4 Morse	1 1-8		23.00
57	50	7 B&S	1 5-8	5-8″ 11	20.00
59	50	9 B&S	1 1-8	N. C., R. H.	21.00
50-10	50	10 B&S	3		23.00

Chuck Adapters

For use on Milling Machines having Standardized Spindle End to provide means of attaching Chucks

Patented



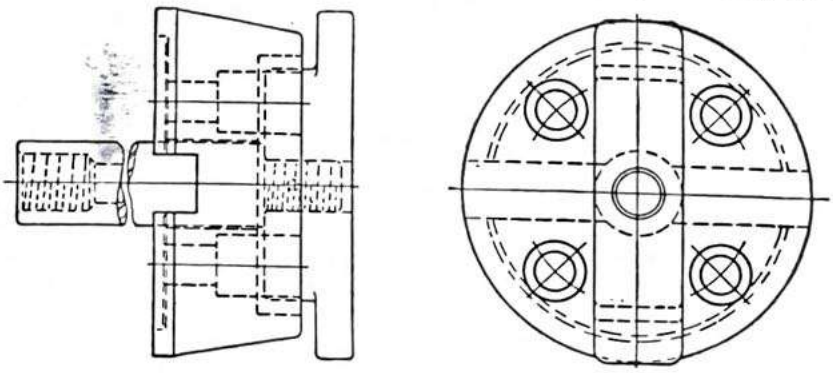


No.	For Spindles with M. M. Std. Taper Hole, No.	Thread of Chuck (A)	Threaded Hole	Price
42 1-4	40	2 1-4″ 4 1-2 N. C., R. H.	7-16″ 14 N. C., R. H.	$19.00
52 1-4	50	2 1-4″ 4 1-2 N. C., R. H.		24.00
52 1-2	50	2 1-2″ 4 N. C., R. H.	5-8″ 11	24.00
52 3-4	50	2 3-4″ 4 N. C., R. H.	N. C., R. H.	24.00

Milling Machine Standard, Brown & Sharpe and Morse Tapers, pages 654 to 656.

Cutter Adapter

For use on Milling Machines having No. 50 Taper Standardized Spindle End, to accommodate Brown & Sharpe Taper-Hole Cutters Nos. A-156, A-157, A-158 and A-159



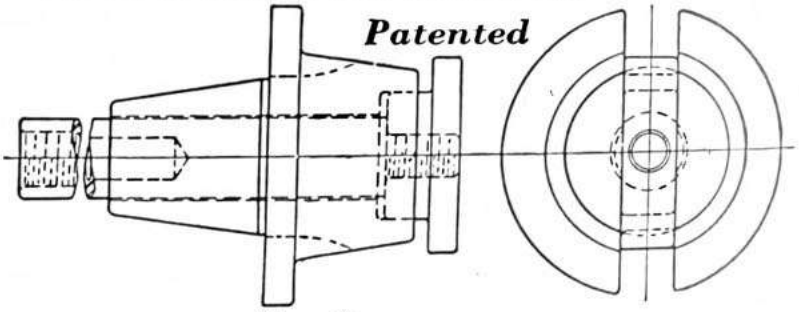
Dimensions of Taper Portion are similar to large Taper-Nose Spindle. Four holding screws attach this adapter securely to Standardized Spindle. Draw-in Bolt then secures cutter with cutter driver as on Taper-Nose Spindle.

Made to order. **Price on application.**

Cutter Adapter

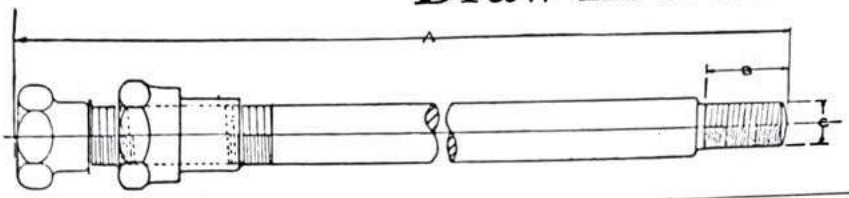
For use on Milling Machines having No. 50 Taper Standardized Spindle End, to accommodate Brown & Sharpe Taper-Hole Cutters Nos. A-150, A-151 and A-152

Dimensions of Taper Portion are similar to small Taper-Nose Spindle. Draw-in Bolt draws cutter driver, cutter and adapter securely into Standardized Spindle End. **Made to Order.**



Price on application.

Draw-In Bolts



To be used with Arbor Adapters Nos. 10A, 11 and 12 listed on next page

No.	A	B	C	Milling Machines where used	Price
10A	27 9-16″	1 1-8″	1-2″ 14, L. H.	A1, A2, AA2 Univ.; B2, BB2, B21 & BY2 Plain	$8.00
*11	28 9-16	1 3-8	3-4 12, L. H.	AA3 Univ. and BB3 Pl.	8.00
**12	32 1-16	1 3-8	3-4 12, L. H.	A3, AA4 Univ.; and B3, BBH3 and BB4 Plain	8.00

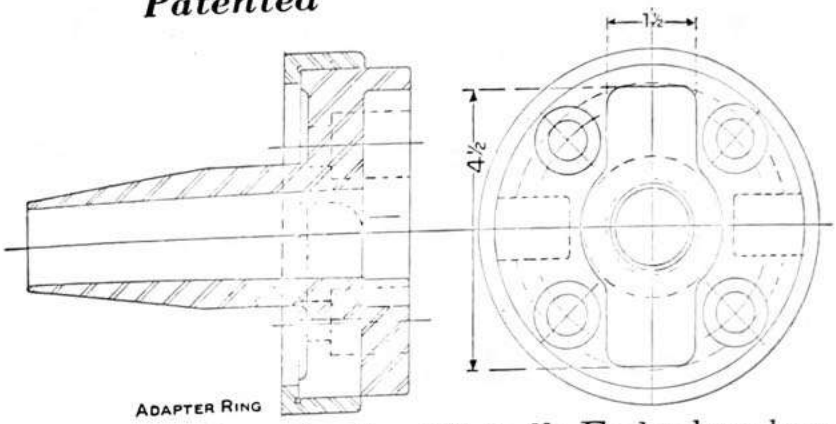
*Can be adapted for use in C2 Vertical Spindle M.M.; further information upon request.

**Can be adapted for use in C3 Vertical Spindle M.M.; further information upon request.

Arbor Adapters

Patented

For use on Milling Machines having No. 50 Taper Standardized Spindle End.



No. 10A permits using with the Standardized Spindle End arbors having No. 10 Brown & Sharpe Taper which were formerly used with Taper-Nose Spindle.

Price, $39.00

No. 11 permits using with the Standardized Spindle End arbors having No. 11 Brown & Sharpe Taper which were formerly used with Taper-Nose Spindle.

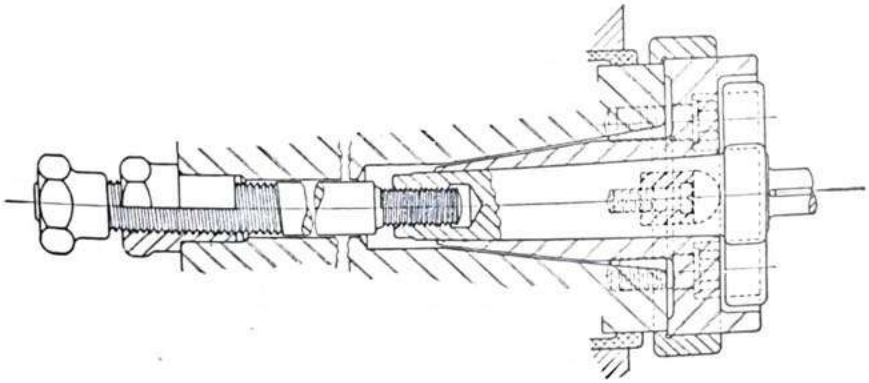
Price, $41.00

No. 12 permits using with the Standardized Spindle End arbors having No. 12 Brown & Sharpe Taper which were formerly used with Taper-Nose Spindle.

Price, $46.00

For use with these Arbor Adapters Special Draw-in Bolts are required. Listed with prices on preceding page.

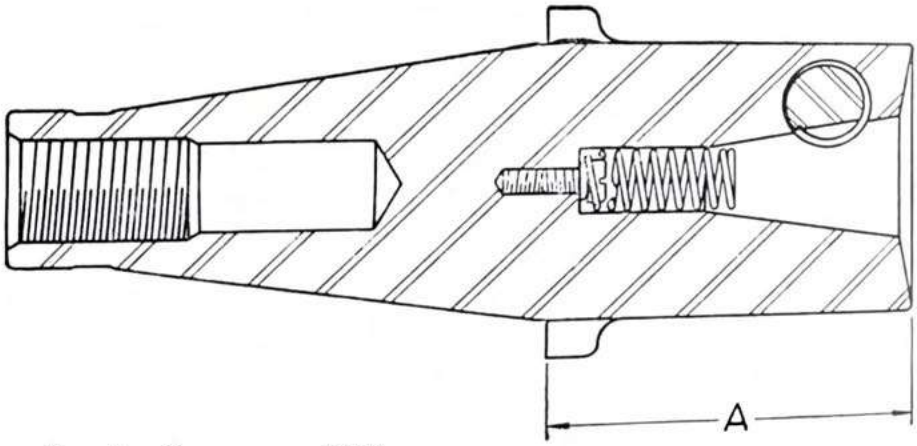
Method of Using Arbor Adapters on Milling Machines having Standardized Spindle End



Cutter Adapters

Patented

For use on Milling Machines having Standardized Spindle End, to accommodate Brown & Sharpe End Mills, etc., having Milling Machine Standard Taper Shanks



Has Cam Lock. See page 532.

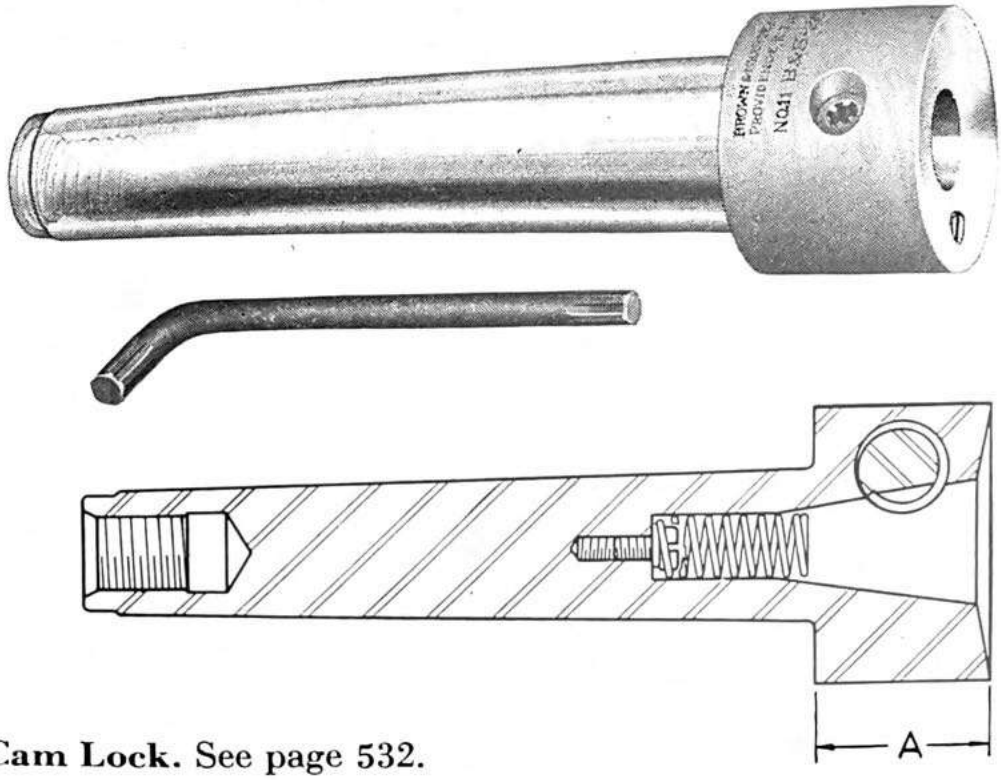
No.	For use with Spindles having M.M. Std. Taper Hole, No.	For End Mills, etc., with Milling Mch. Std. Taper Shank, No.	A, Inches	Threaded Hole	Price
40-10-1½	40	10	1 1-2	5-8″ 11 N. C., R. H.	$24.00
40-20-1½	40	20	1 1-2		24.00
40-30-1½	40	30	1 1-2		24.00
50-10-1¾	50	10	1 3-4	1″ 8 N. C., R. H.	30.00
50-20-1¾	50	20	1 3-4		30.00
50-30-1¾	50	30	1 3-4		30.00
50-10-3½	50	10	3 1-2		30.00
50-20-3½	50	20	3 1-2		30.00
50-30-3½	50	30	3 1-2		30.00

Milling Machine Standard Tapers, page 656.

Cutter Adapters

Patented

For use on Brown & Sharpe Milling Machines having either Taper- or Threaded-Nose Spindle to accommodate Brown & Sharpe End Mills, etc., having Milling Machine Standard Taper Shanks



Has Cam Lock. See page 532.

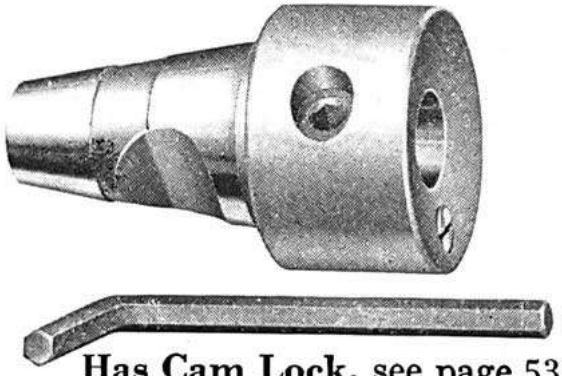
No.	For use with Spindles having B&S Taper Hole, No.	For End Mills, etc., with M. M. Std. Taper Shank, No.	A, Inches	Threaded Hole	Price
9 B&S-10-2	9	10	1 5-8	7-16″ 14 L. H.	$25.00
9 B&S-20-2	9	20	1 5-8		25.00
9 B&S-30-2	9	30	2		25.00
10 B&S-10-2	10	10	1 11-16	1-2″ 14 L. H.	25.00
10 B&S-20-2	10	20	1 5-8		25.00
10 B&S-30-2½	10	30	2 1-8		25.00
11 B&S-10-2	11	10	1 5-8	3-4″ 12 L. H.	25.00
11 B&S-20-2	11	20	1 5-8		25.00
11 B&S-30-2	11	30	1 5-8		25.00

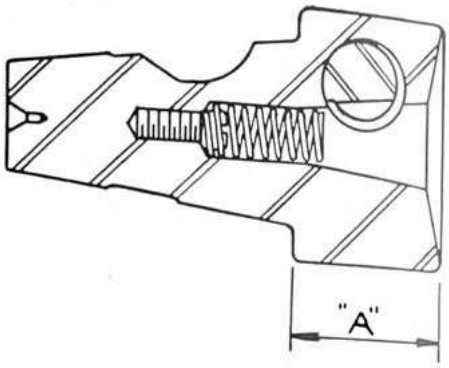
Milling Machine Standard and Brown & Sharpe Tapers, pages 654 to 656.

Cutter Adapters

Patented

For use with Cutter Adapters and Milling Attachment Spindles with *Cam Lock to accommodate Brown & Sharpe End Mills, etc., having Milling Machine Standard Taper Shanks



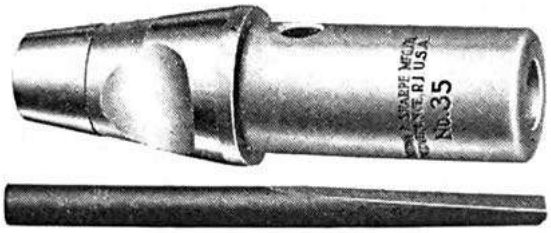


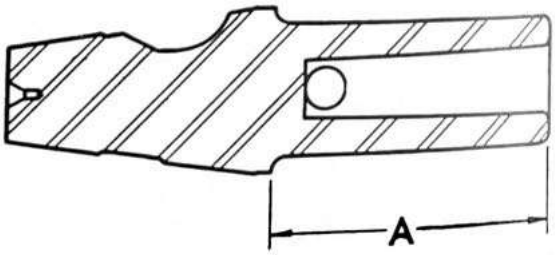
Has Cam Lock, see page 532.

No.	For use in M.M. Std. Taper Hole, No.	For End Mills, etc., with M.M. Std. Taper Shank, No.	A, Inches	Price
30-10-1¼	30	10	1 1-8	$18.00
30-20-1½	30	20	1 3-8	18.00

Cutter Adapters

For use with Adapters with *Cam Lock to accommodate End Mills, etc., having Brown & Sharpe Taper Shanks





No.	For use with Adapters having M.M Std. Taper Hole, No.	For End Mills, etc., with Taper Shank, No.	A, Inches	Price
35	30	5 B&S	2 1-4	$12.00
37	30	7 B&S	4	12.00

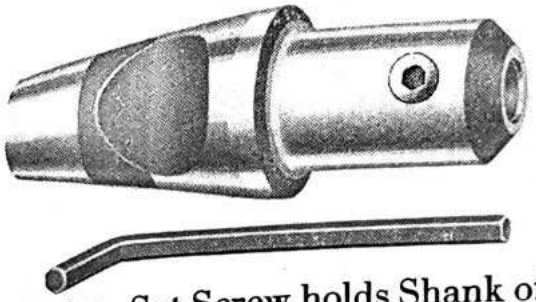
*See page 532.

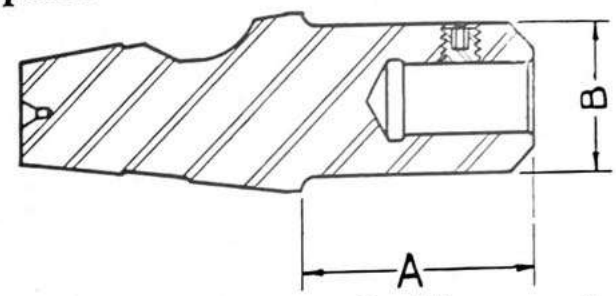
Milling Machine Standard and Brown & Sharpe Tapers, pages 654 to 656.

Cutter Adapters

for Straight Shank End Mills

For use with Adapters with *Cam Lock





Safety Set Screw holds Shank of End Mill or Adapter Bushing securely in Adapter.

No.	For Use with Adapters having M.M. Standard Taper Hole, No.	Diam. of Hole	A, Inches	B, Inches	Price
30 1/8	30	1-8	1 1-4	11-16	$11.00
30 3/16	30	3-16	1 5-16	3-4	11.00
30 1/4	30	1-4	1 3-8	13-16	11.00
30 3/8	30	3-8	1 1-2	15-16	11.00
30 1/2	30	1-2	1 3-4	1 1-16	11.00
30 5/8	30	5-8	2 1-16	1 3-8	11.00
30 3/4	30	3-4	2 1-16	1 3-8	11.00

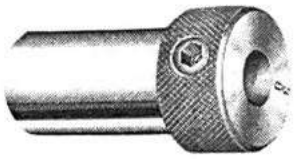
*See page 532.

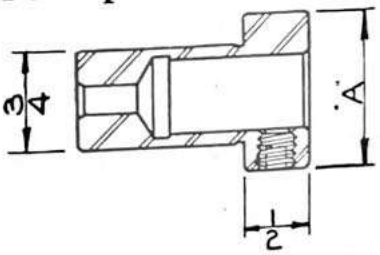
Milling Machine Standard Tapers, page 656.

Cutter Adapter Bushings

for Straight Shank End Mills

For use with Cutter Adapter No. 30 3/4





Safety Set Screw holds Shank of End Mill securely in Bushing.

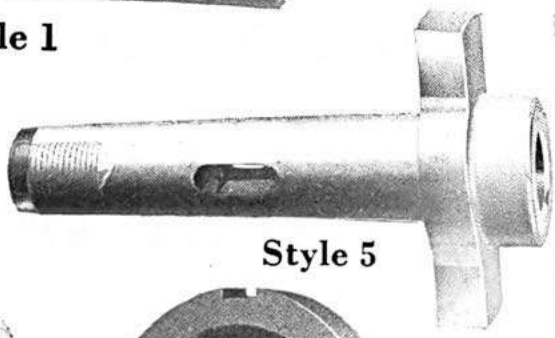
No.	Diam. of Hole, Inches	A, Inches	Price	No.	Diam. of Hole, Inches	A, Inches	Price
300A	1-8	13-16	$1.50	300F	5-16	15-16	$1.50
300B	5-32	13-16	1.50	300G	3-8	1	1.50
300C	3-16	13-16	1.50	300H	7-16	1 1-16	1.50
300D	7-32	13-16	1.50	300I	1-2	1 1-8	1.50
300E	1-4	7-8	1.50	300J	9-16	1 3-16	1.50

Collets

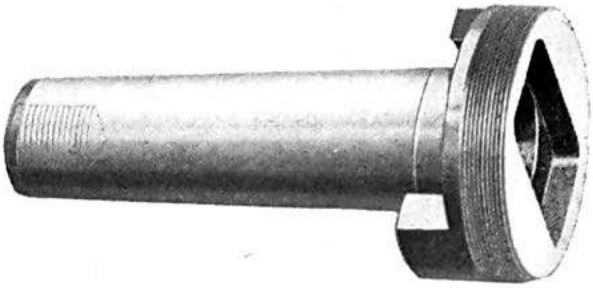
For use on Brown & Sharpe Milling Machines having Taper-Nose Spindle

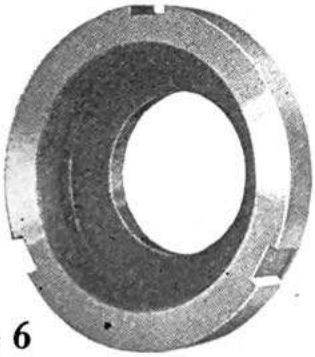
Style 1

Style 2



Style 5





*Style 6

Collets with Nos. 4 and 5 Taper Holes are designed for shanks without tenons.

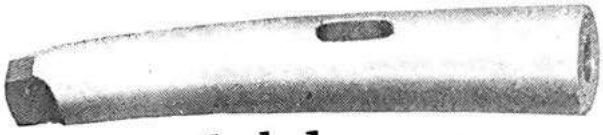
Mark	Outside Taper	Inside Taper	Style	Collet to Spindle, Inches	Threaded Hole	Price
AA	7	4	1	5-16		$4.25
EF	10	5	2	2 1-16	1-2″ 14 L. H.	7.50
BB	10	7	2	1 1-4		8.25
FF	10	9	2	1 1-4		8.25
QQ	11	7	2	1 3-4		9.00
O	11	9	2	1-4		10.50
GO	11	9	5	2		14.00
GH	11	9	5	1		14.00
PQ	11	10	5	1 3-4	3-4″ 12 L. H.	14.00
SS	12	9	2	7-16		12.50
ST	12	9	5	1 1-4		14.00
OP	12	10	5	1 1-2		14.00
TU	14	9	5	1 1-4	1″ 10 L. H.	15.00
*AB	12	11	6	1 3-8	3-4″ 12 L. H.	35.00
*CD	14	12	6	1 1-8	1″ 10 L. H.	45.00

*Permits arbors D and E for Threaded-Nose Spindle to be used with Taper-Nose Spindle.

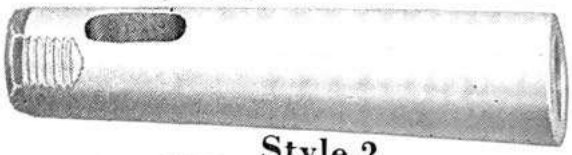
Brown & Sharpe Tapers, pages 654 to 656.

Collets

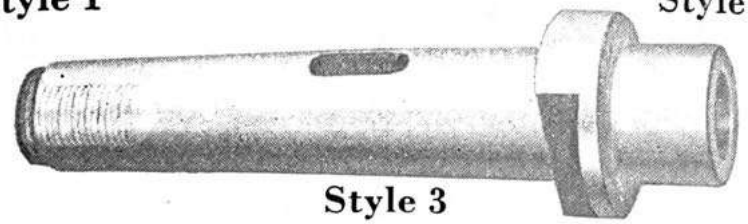
*For use on Brown & Sharpe Milling Machines having Threaded-Nose Spindle



Style 1



Style 2



Style 3

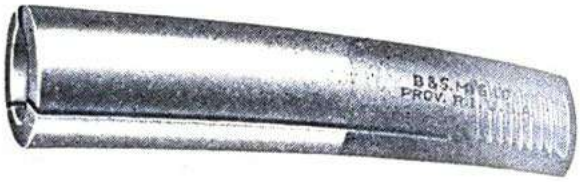
Collets with Nos. 4 and 5 Taper Holes are designed for shanks without tenons. **Style 2A.** Similar to Style 2, but no threaded hole. Style 3A. Similar to Style 3, but no threaded hole.

Mark	Outside Taper	Inside Taper	Style	Collet to Spindle, Inches	Diam. Threaded Hole, Inches	Price
A	7	4	1	1 9-16	.....	$4.25
J	7	4	2	5-16	3-8, 16, L. H.	4.25
N	7	5	1	2 5-16	.....	4.25
R	7	5	2	3-4	3-8, 16, L. H.	4.25
C	9	5	1	2 1-8	.....	5.75
D	9	5	1	3-4	.....	5.25
K	9	5	2	3-8	7-16, 14, L. H.	5.25
KK	9	7	1	3-4	.....	6.75
RR	9	7	2	7-8	7-16, 14, L. H.	6.75
EE	10	5	1	2 1-16	.....	7.50
DD	10	7	1	2 5-8	.....	7.50
E	10	7	1	1 5-8	.....	7.50
BB	10	7	2	1 1-4	1-2, 14, L. H.	8.25
Z	10	7	2A	1-2	.....	7.50
F	10	9	1	1	.....	8.25
FF	10	9	2	1 1-4	1-2, 14, L. H.	8.25
Q	11	7	1	1 3-4	.....	9.00
G	11	9	1	2 3-8	.....	9.75
O	11	9	2	1-4	3-4, 12, L. H.	10.50
H	11	9	3	1 5-8	3-4, 12, L. H.	12.50
GG	11	10	3A	1-2	.....	12.50
SS	12	9	2	7-16	3-4, 12, L. H.	12.50
T	12	9	3A	1 11-16	.....	18.00
*V	12	10	2	7-8	3-4, 12, R. H.	13.00
P	11	10	1	1 3-8	.....	13.00
PP	12	10	3A	1 11-16	.....	18.00
*VV	12	11	2	1 7-8	3-4, 12, R. H.	13.00
TT	12	11	3A	1 11-16	.....	18.00
UU	12	9	3	1 11-16	3-4, 12, L. H.	18.00
*WW	14	10	2	7-8	3-4, 12, R. H.	18.00
*W	14	11	2	7-8	3-4, 12, R. H.	18.00
*WV	14	12	2	7-8	3-4, 12, R. H.	18.00
*XX	16	11	2	7-8	7-8, 10, R. H.	37.00
*X	16	12	2	7-8	7-8, 10, R. H.	37.00
*YY	18	11	2	7-8	1, 10, R. H.	44.00
*Y	18	14	2	7-8	1, 10, R. H.	44.00

Brown & Sharpe Tapers, pages 654 to 656.
*Suitable for use on Gear Cutting and Hobbing Machines.

Collets

Spring Collets with Straight Holes for use on Milling Machine Attachments



Outside Taper	Diam. of Hole, Inches	Depth of Hole, Inches	Threaded Hole	Price
7	1-8	1-2	3-8″ 16 N. C., R. H.	$6.00
7	3-16	5-8		6.00
7	1-4	3-4		6.00
7	5-16	7-8		6.00
7	3-8	1		6.00
7	7-16	1 1-16		6.00
7	1-2	1 1-8		6.00
9	1-8	1-2	1-2″ 13 N. C., R. H.	8.00
9	3-16	5-8		8.00
9	1-4	3-4		8.00
9	5-16	7-8		8.00
9	3-8	1		8.00
9	7-16	1 1-16		8.00
9	1-2	1 1-8		8.00
9	5-8	1 3-8		8.00
9	3-4	1 1-2		8.00

Other Sizes made to order.

Special Draw-In Bolts with right-hand threads are required for use with these collets.

Collet Blanks

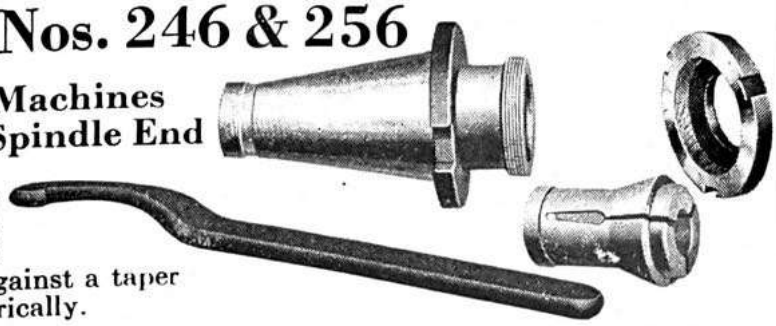
Blanks with Nos. 4 and 5 Taper holes are designed for shanks without tenons and have round hole for Knockout Key.

Diam., Inches	Length Over All, Inches	No. Taper Hole	Price
3-4	5 1-4	4	$4.20
1 1-8	8 1-2	5	5.60
1 5-8	10	7	8.40
1 5-8	12	9	9.50
2	14	10	10.50

Brown & Sharpe Tapers, pages 654 to 656.

Spring Chucks Nos. 246 & 256

For use on Milling Machines having Standardized Spindle End



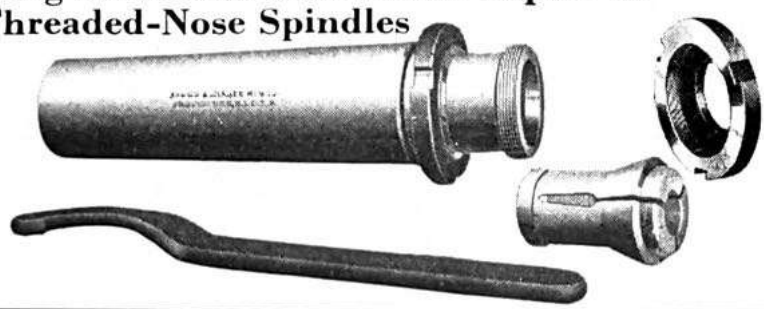
Convenient for holding wire, small rods, straight shank drills, mills, etc. The cap nut forces spring collet against a taper seat and closes chuck concentrically.

No.	Fits M.M. Std. Taper Hole No.	Hole, Inches		Threaded Hole	Round Collet Furnished		Price
		Diam.	Depth		No.	Size, In.	
246	40	3-4	5 13-16	7-16″ 14 N.C.,R.H.	21	1-2	$21.00
256	50	1 7-32	6 1-4	5-8″ 11 N.C.,R.H.	21	5-8	26.00

Spring Chucks Nos. 150, 152, 154, 156, 158 & 160

For use on Milling Machines with either Taper- or Threaded-Nose Spindles

Convenient for holding wire, small rods, straight shank drills, mills, etc. The hole extends through entire length. The cap nut forces spring collet against a taper seat and closes chuck concentrically.



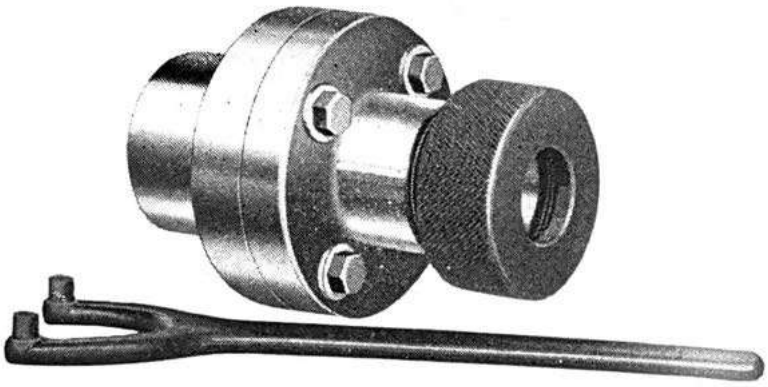
No. of Chuck	No. of Outside Taper	Hole Through, Inches	Machines where used	R'nd. Coll. Furn.		Price
				No.	Size, Inches	
150	7	5-16	0 and 1 Vert. Sp. Att.	00	1-4	$16.00
152	9	1-2	1 Comp. and 1 Univ. Mill. Att. 00-0-0Y Pl. M. M. 6 Univ. Index Centers	00	5-16	16.00
154	10	21-32	*1-*1A-2-2A Univ. *1-*1B-1Y-2-2B-2Y Pl.; and 21 Auto. M. M. 1 Vert. Sp. M. M. 10″ and 12″ Pl. and 10″ Univ. Index Centers	10	3-8	20.00
156	11	3-4	2A Hy -3-3A Univ. M. M. 12″ and 14″ Univ. Index Cent. 2 Hy.-2B Hy.-3-3B-13 B Pl. 2 and 5 Vert. Sp. M. M. 33 Auto. M. M.	21	5-8	21.00
158	12	1	3A Hy.-4A Univ. M. M. 3B Hy.-4B Pl. M. M. 12 1-2″ and 15″ Univ. Index Centers; 3 Vert. Sp. M. M.	21	5-8	24.00
160	14	1	4A Hy. Univ. M. M.; 4B Hy.-5B Hy. Pl. M. M.	21	5-8	26.50

*With or without Back Gears.

Milling Machine Standard and Brown & Sharpe Tapers, pages 654 to 656.

Spring Chuck No. 350

For use on No. 1 Universal Grinding Machine and No. 13 Universal and Tool Grinding Machine



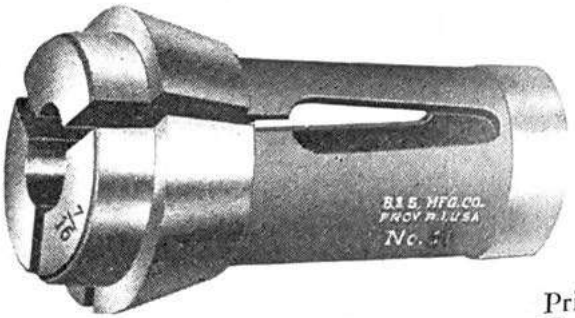
Holds conveniently bushings, needle valves, wire, long thin rods, etc., through headstock. A No. 11 Spring Collet is held in place by knurled nut that forces it against taper seat and closes chuck concentrically.

Collet Holder is bolted to holder plate which is threaded to fit headstock spindle of machine. The Holder floats on plate so that work can be accurately centered in machine, permitting work of the highest accuracy. A pin wrench is furnished to tighten body securely on spindle.

Price, without Spring Collet $32.00
No. 11 Spring Collet Round 1-16″ to 15-32″ by 64ths; 1-2″ to 5-8″ by 32nds; 11-16″, 3-4″ and 13-16″, extra 4.75
Square 3-16″ to 3-8″ by 16ths, extra 8.00
Hexagonal 3-16″ to 11-16″ by 16ths, extra 8.00

Spring Collets

For use with Spring Chucks for Milling Machines



	Price, Each
No. 00, for Chucks Nos. 150 and 152, Round, 1-16″ to 1-2″ by 64ths	$4.00
Square or Hexagonal, made to order	8.00
No. 10, for Chuck No. 154, Round, 1-16″, 3-32″ to 5-16″, by 64ths; 11-32″ to 1-2″, by 32nds; 9-16″, 5-8″	4.75
Square, 3-16″ and 1-4″	8.00
Hexagonal, 3-16″, 1-4″ and 5-16″	8.00
No. 21, for Chucks Nos. 156, 158, 160, 246 and 256, Round, 1-8″ to 21-32″, by 32nds; 11-16″ to 1″, by 16ths	5.25
Square, 1-4″, 5-16″, 3-8″ and 7-16″	8.25
Hexagonal, 1-4″, 5-16″, 3-8″, 7-16″ and 1-2″	8.25

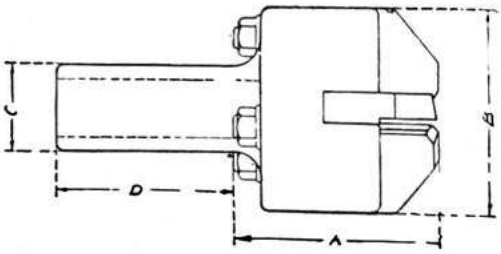
Other sizes made to order.

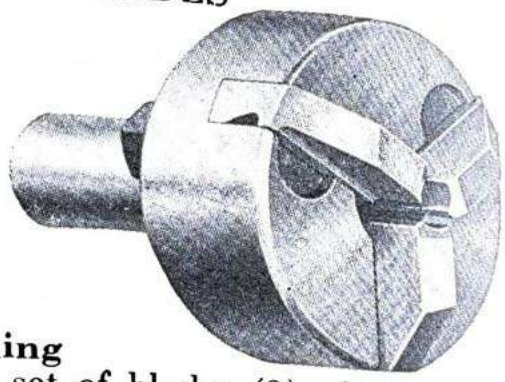
Screw Machine Tools

B·S

Brown & Sharpe
Screw Machine Tools
on Brown & Sharpe
Screw Machines
Give Maximum Production
at Lowest Cost

Adjustable Hollow Mills
WITH INSERTED BLADES





Roughing

Each holder is furnished with one set of blades (3) of any regular size required. The blades are held firmly in position by a simple clamping device, which is operated by nuts at the back of head.

Blades turn large, as follows: 1/4″ to 7/16″, about .012″; 1/2″ to 3/4″, about .016″; 13/16″ to 1 1/8″, about .02″. Blades for Nos. 3, 4 and 5 interchange.

The stock sizes of blades run by 16ths of an inch between the limits given under "Capacity," except on Nos. 00 and 0 Mills.

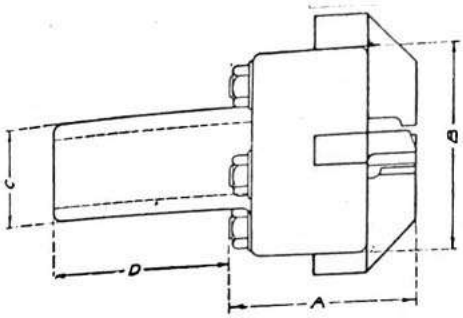
Set of blades turns one size only except where noted.

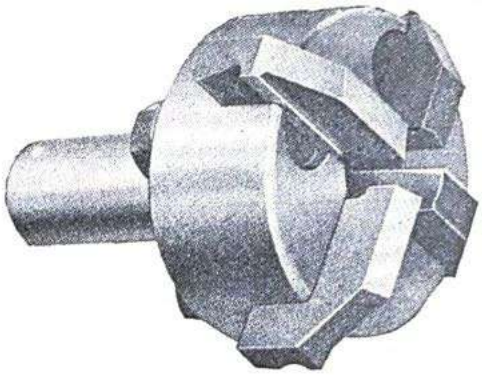
When ordering, specify turning size of blades wanted.

No. of Mill	Number of Machine where used	Capacity, Inches	Length of Body and Blades, Inches A	Diameter Outside, Inches B	Diameter of Shank, Inches C	Length of Shank, Inches D	Price with one set of High Speed Steel Blades	Price of extra High Speed Steel Blades, per set
†00	00, 00G, 19 Auto.	.03 to 3-8	1 3-16	1 1-2	5-8	1 1-8	$12.00	$4.00
†0	0 Wire Feed	.03 to 3-8	1 1-4	1 3-4	5-8	1 7-16	19.00	5.50
1	1 Pl. begin'g 230* 1 Wire Feed	3-16 to 1-2	2 1-2	2 1-4	3-4	2	22.50	9.50
3	2 Pl. begin'g 455* 2 and 2F Wire Fd.	1-4 to 3-4	3 1-4	3	1	2 1-2	24.75	11.50
4	4 Pl. prior to 428* 5 Pl. prior to 428*	1-4 to 3-4	3 1-4	3	1 1-16	3 1-4	24.75	11.50
5	6 Pl. prior to 59*	1-4 to 3-4	3 1-4	3	1 1-4	3 1-4	24.75	11.50
6	4 Pl. 428 to 601* 4 W.F. prior to 23* 5 Pl. 428 to 581* 6 Pl. 59 to 230*	1-2 to 1 1-8	3 3-8	3 1-2	1 1-2	3 1-4	28.00	13.00
24	4 and 5 Pl.; 4 W.F.	1-2 to 1 3-16	3 3-8	3 1-2	1 3-4	3 1-4	30.00	13.00
26	6 Pl. and 6 W.F.	1-2 to 1 3-8	3 3-8	3 3-4	2	3 1-4	32.00	14.00

*Be sure to give serial number of machine.
†One set of blades turns all sizes within capacity.

Adjustable Hollow Mills
WITH INSERTED BLADES





Finishing

The Finishing Mills have two blades and two back rests which will turn any size within the capacity of the mill.

The blades are held firmly in position by a simple clamping device, which is operated by nuts at the back of the head.

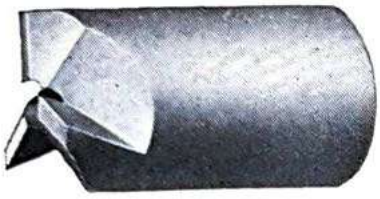
Two extra blades are included in "Price of Mill Complete."

Blades for Nos. 13, 14 and 15 interchange.

No. of Mill	Number of Machine where used	Capacity, Inches	Length of Body and Blades, Inches A	Diameter, Outside, Inches B	Diameter of Shank, Inches C	Length of Shank, Inches D	Price of Mill Complete with High Speed Steel Blades	Price of 4 High Speed Steel Blades	Price of 2 Back Rests
100	00, 00G, 19 Auto.	.03 to 3-8	1 3-16	1 1-2	5-8	1 1-8	$14.50	$5.00	$1.50
10	0 Wire Feed	.03 to 3-8	1 1-4	1 3-4	5-8	1 7-16	24.00	7.00	2.10
11	1 Pl. begin'g 230* 1 Wire Feed	3-16 to 1-2	2 1-2	2 1-4	3-4	2	26.50	8.50	2.60
13	2 Pl. begin'g 455* 2 & 2F Wire Feed	1-4 to 3-4	3 1-4	3	1	2 1-2	30.00	13.00	3.00
14	4 Pl. prior to 428* 5 Pl. prior to 428*	1-4 to 3-4	3 1-4	3	1 1-16	3 1-4	30.00	13.00	3.00
15	6 Pl. prior to 59*	1-4 to 3-4	3 1-4	3	1 1-4	3 1-4	30.00	13.00	3.00
16	4 Pl. 428 to 601* 4 W.F. prior to 23* 5 Pl. 428 to 581* 6 Pl. 59 to 230*	1-2 to 1 1-8	3 3-8	3 1-2	1 1-2	3 1-4	35.00	16.00	3.25
34	4 & 5 Pl.; 4 W. F.	1-2 to 1 3-16	3 3-8	3 1-2	1 3-4	3 1-4	37.00	16.00	3.25
36	6 Pl. & 6 W. F.	1-2 to 1 3-8	3 3-8	3 3-4	2	3 1-4	39.00	16.00	3.50

*Be sure to give serial number of machine.

Plain Hollow Mills



Style 2

Plain Hollow Mills are used in turrets of screw machines for roughing cuts. They are made with two forms of teeth, one undercut, as shown in illustrations, for milling steel, and one straight, for milling brass. These mills turn large as follows: up to and including 7-32″, approximately, .007″; 1-4″ to 11-16″ inclusive, approximately .011″.

Style 3

No. of Mill	Style	No. of Machine where used	Sizes Carried in Stock, Inches	Diameter of Shank, Inches	Length of Shank, Inches	Diameter of Head, Inches	Length of Head, Inches	Total Length, Inches	Carbon Steel Mills, Price	High Speed Steel Mills, Price
†00C	2	00, 00G and 19 Auto.	1/16 to 7/32 by 64ths	No. 5 Taper		1/2		1 1/8	$2.05	$2.50
*00D	2					1/2		1 1/8	2.05	
20A	3	0 and 0G Au. 1 W.F.	1/8 to 5/16 by 64ths	5/8	7/8	3/4	7/8	1 3/4	3.00	3.60
*20B	3	0 and 0G Au. 1 W.F.	1/8 to 3/8 by 32nds	5/8	7/8	3/4	7/8	1 3/4	3.00	
21A	2	1 Auto.	1/8 to 3/8 by 32nds	3/4		3/4		2	3.40	4.00
22A	2	2 and 2G Au. 2 & 2F W.F.	1/4 to 7/16 by 32nds	1		1		2 1/4	3.40	4.10
22C	3	2 and 2G Au. 2 & 2F W.F.	15/32 to 11/16 by 32nds	1	1 3/16	1 1/4	1 1/16	2 1/4	4.15	5.00

*For Brass. †Made in both Right- and Left-Hand Styles. Unless specified otherwise we ship Right-Hand

Hollow Mill Blanks

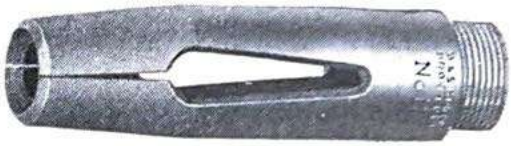
The shanks of the blanks are finished and drilled. State style wanted when ordering.

Style	No. of Machine where used	Carbon Steel, Price	High Speed Steel, Price
2	For Nos. 00, 00G and 19 Automatic	$0.45	$0.75
3	For Nos. 0 and 0G Automatic	.50	1.15
2	For No. 1 Automatic	.75	
2	For Nos. 2 and 2G Automatic	.75	2.35
3	For Nos. 2 and 2G Automatic	.75	2.85

Spring Collets and Feeding Fingers

For Automatic and Wire Feed Screw Machines

Spring Collet



Feeding Finger

Nos. 00, 00G and 19 Automatic

	Price, Each
No. 00 Spring Collets:	
Round: 1-16″, 5-64″, 3-32″, 7-64″, 1-8″, 9-64″, 5-32″, 11-64″, 3-16″, 13-64″, 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″	$4.00
Square: 3-32″, 1-8″, 5-32″, 3-16″, 7-32″	8.00
Hexagonal: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″	8.00
Metric, Round: 2 mm to 8 mm, varying by 1-2 mm	4.00
Collet Blanks	2.35
No. 00 Feeding Fingers:	
Round: 1-16″, 5-64″, 3-32″, 7-64″, 1-8″, 9-64″, 5-32″, 11-64″, 3-16″, 13-64″, 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″	2.25
Square: 3-32″, 1-8″, 5-32″, 3-16″, 7-32″	4.00
Hexagonal: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″	4.00
Metric, Round: 2 mm to 8 mm, varying by 1-2 mm	2.25
Feeding Finger Blanks	1.10
No. 00 Spring Collets, for use with 3-8″ Feed Tube:	
Round: 21-64″, 11-32″, 3-8″	4.00
Square: 1-4″	8.00
Hexagonal: 9-32″, 5-16″	8.00
Metric, Round: 8 1-2, 9, 9 1-2 mm	4.00
Collet Blanks	2.35
***No. 00A Feeding Fingers, for 3-8″ Feed Tube:**	
Round: 21-64″, 11-32″, 3-8″	2.25
Square: 1-4″	4.00
Hexagonal: 9-32″, 5-16″	4.00
Metric, Round: 8 1-2, 9, 9 1-2 mm	2.25
Feeding Finger Blanks	1.10
No. 00D Feeding Fingers, for 7-16″ Feed Tube:	
Round: 11-32″, 3-8″, 13-32″, 7-16″	3.25
Square: 1-4″, 5-16″	5.25
Hexagonal: 9-32″, 5-16″, 11-32″, 3-8″	5.25
Feeding Finger Blanks	2.10

*Two feed tubes are furnished with No. 19 Automatic, one taking No. 00 Feeding Fingers and the other No. 00A Feeding Fingers. 3-8″ Feed Tube for Nos. 00 and 00G Automatics is furnished as an extra.

List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

Nos. 0 and 0G Automatic

No. 1 Wire Feed (Prior to Machine Serial No. 227)

	Price, Each
No. 11 Spring Collets:	
Round: 1-16″, 5-64″, 3-32″, 7-64″, 1-8″, 9-64″, 5-32″, 11-64″, 3-16″, 13-64″, 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″, 21-64″, 11-32″, 23-64″, 3-8″, 25-64″, 13-32″, 27-64″, 7-16″, 29-64″, 15-32″, 1-2″	$4.75
Square: 3-16″, 1-4″, 5-16″, 3-8″	8.00
Hexagonal: 3-16″, 1-4″, 5-16″, 3-8″, 7-16″	8.00
Metric, Round: 6 mm to 12 mm, varying by 1-2 mm	4.75
Collet Blanks	2.65
No. 11 Feeding Fingers:	
Round: 1-16″, 5-64″, 3-32″, 7-64″, 1-8″, 9-64″, 5-32″, 11-64″, 3-16″, 13-64″, 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″, 21-64″, 11-32″, 23-64″, 3-8″, 25-64″, 13-32″, 27-64″, 7-16″, 29-64″, 15-32″, 1-2″	3.00
Square: 3-16″, 1-4″, 5-16″, 3-8″	4.25
Hexagonal: 3-16″, 1-4″, 5-16″, 3-8″, 7-16″	4.25
Metric, Round: 6 mm to 12 mm, varying by 1-2 mm	3.00
Feeding Finger Blanks	1.45

Nos. 0 and 0G Automatic

No. 11 Spring Collets, for use with 5-8″ Feed Tube:	
Round: 17-32″, 9-16″, 19-32″, 5-8″	4.75
Hexagonal: 1-2″	8.00
Metric, Round: 12 1-2 mm to 16 mm, varying by 1-2 mm	4.75
Collet Blanks	2.65
No. 11A Feeding Fingers, for 5-8″ Feed Tube:	
Round: 17-32″, 9-16″, 19-32″, 5-8″	3.00
Hexagonal: 1-2″	4.25
Metric, Round: 12 1-2 mm to 16 mm, varying by 1-2 mm	3.00
Feeding Finger Blanks	1.45
No. 11 Spring Collets, for use with Outside Feeding Attachment:	
Round: 9-16″, 5-8″, 11-16″, 3-4″, 13-16″	4.75
Hexagonal: 1-2″, 9-16″, 5-8″, 11-16″	8.00
Metric, Round: 14 mm to 20 mm, varying by 1 mm	4.75
Collet Blanks	2.65
No. 20C Master Feeding Finger, for use with Outside Feeding Attachment on No. 0 Auto. prior to Machine Serial No. 5691 and on No. 0G Auto. prior to Machine Serial No. 5465	
Takes interchangeable sets of pads as listed below	19.00
No. 20E Master Feeding Finger, for use with Outside Feeding Attachment on No. 0 Auto. commencing with Machine Serial No. 5691 and on No. 0G Auto. commencing with Machine Serial No. 5466	
Takes interchangeable sets of pads as listed below	28.00
Pads for 20C and 20E Master Feeding Fingers:	
Round: From 9-16″ to 13-16″, inclusive, by 16ths, sets of three	6.00
Hexagonal: from 1-2″ to 11-16″, inclusive, by 16ths, sets of three	8.00
*Square: From 3-8″ to 9-16″, inclusive, by 16ths, sets of four	9.00
*Metric: Round from 14 mm to 20 mm, inclusive, sets of three	6.75

*Made to order. List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

No. 0 Wire Feed

	Price, Each
No. 10 Spring Collets:	
Round: 1-16″, 3-32″, 7-64″, 1-8″, 9-64″, 5-32″, 11-64″, 3-16″, 13-64″, 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″, 11-32″, 3-8″	$4.75
Square: 3-16″, 1-4″	8.00
Hexagonal: 3-16″, 1-4″, 5-16″	8.00
Metric, Round: 4 mm to 10 mm, varying by 1-2 mm	4.75
Collet Blanks	2.65
No. 10 Feeding Fingers:	
Round: 1-16″, 3-32″, 7-64″, 1-8″, 9-64″, 5-32″, 11-64″, 3-16″, 13-64″ 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″, 11-32″, 3-8″	3.00
Square: 3-16″, 1-4″	4.25
Hexagonal: 3-16″, 1-4″, 5-16″	4.25
Metric, Round: 4 mm to 10 mm, varying by 1-2 mm	3.00
Feeding Finger Blanks	1.45
No. 10 Spring Collets, for use with 1-2″ Feed Tube:	
Round: 13-32″, 7-16″, 15-32″, 1-2″	4.75
Hexagonal: 3-8″ and 7-16″	8.00
Collet Blanks	2.65
No. 11C Feeding Fingers, for use with 1-2″ Feed Tube:	
Round: 13-32″, 7-16″, 15-32″, 1-2″	3.00
Hexagonal: 3-8″, and 7-16″	4.25
Feeding Finger Blanks	1.45

No. 1 Automatic

No. 1 Wire Feed (Commencing Machine Serial No. 227)

No. 21 Spring Collets:	
Round: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″	5.25
Square: 1-4″, 5-16″, 3-8″, 7-16″	8.25
Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″	8.25
Metric, Round: 6 mm to 16 mm, varying by 1-2 mm	5.25
Collet Blanks	3.00
No. 21 Feeding Fingers:	
Round: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″	3.00
Square: 1-4″, 5-16″, 3-8″, 7-16″	4.25
Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″	4.25
Metric, Round: 6 mm to 16 mm, varying by 1-2 mm	3.00
Feeding Finger Blanks	1.45
No. 21 Spring Collets, for use with 3-4″ Feed Tube:	
Round: 21-32″, 11-16″, 23-32″ and 3-4″	5.25
Hexagonal: 9-16″, and 5-8″	8.25
Collet Blanks	3.00

List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

***No. 21A Feeding Fingers, for use with 3-4″ Feed Tube:**

	Price, Each
Round: 21-32″, 11-16″, 23-32″, and 3-4″	$3.00
Hexagonal: 9-16″, 5-8″	4.25
Feeding Finger Blanks	1.45

Nos. 2 and 2G Automatic
Nos. 2 and 2F Wire Feed (Commencing Machine Serial No. 383)

No. 22 Spring Collets:

Round: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″, 21-32″, 11-16″, 23-32″, 3-4″, 25-32″, 13-16″, 27-32″, 7-8″, 29-32″, 15-16″, 31-32″, 1″	6.25
Square: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″	8.75
Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″, 13-16″, 7-8″	8.75
Metric, Round: 10 mm to 25 mm, varying by 1 mm	6.25
Collet Blanks	3.00

No. 22 Feeding Fingers:

Round: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″, 21-32″, 11-16″, 23-32″, 3-4″, 25-32″, 13-16″. 27-32″, 7-8″, 29-32″, 15-16″, 31-32″, 1″	3.75
Square: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″	4.75
Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″, 13-16″, 7-8″	4.75
Metric, Round: 10 mm to 25 mm, varying by 1 mm	3.75
Feeding Finger Blanks	1.80

No. 22B Spring Collets, for use with 1 1-8″ Feed Tube:

Round: 1 1-16″, 1 1-8″	8.00
Hexagonal: 15-16″	12.00
Metric, Round: 26, 27, 28 mm	8.00
Collet Blanks	4.75

No. 22A Feeding Fingers, for 1 1-8″ Feed Tube:

Round: 1 1-16″, 1 1-8″	4.75
Hexagonal: 15-16″	8.00
Metric, Round: 26, 27, 28 mm	4.75
Feeding Finger Blanks	3.00

Nos. 2 and 2G Automatic

No. 22A Spring Collets, for use with Outside Feeding Attachment, for Machines with 1 5-16″ Hole in Spindle:

Round: 1 1-16″, 1 1-8″, 1 3-16″, 1 1-4″	8.00
Hexagonal: 1″, 1 1-16″, 1 1-8″	12.00
Collet Blanks	4.75

*Used only on No. 1 Wire Feed commencing with Machine Serial No. 495.

List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

No. 22B Spring Collets, for use with Outside Feeding Attachment, for Machines with 1 7-16″ Hole in Spindle:

	Price, Each
Round: 1 1-16″, 1 1-8″, 1 3-16″, 1 1-4″, 1 5-16″, 1 3-8″	$8.00
Hexagonal: 1″, 1 1-16″, 1 1-8″, 1 3-16″	12.00
Metric, Round: 26 mm to 35 mm, varying by 1 mm	8.00
Collet Blanks	4.75

No. 22C Master Feeding Finger, for use with Outside Feeding Attachment on No. 2 Auto. having machine serial numbers from 2455 to 5410 inclusive.

Takes interchangeable sets of pads as listed below 25.00

No. 22E Master Feeding Finger, for use with Outside Feeding Attachment on Nos. 2 and 2G Auto. having machine serial numbers from 5411 to 5857 inclusive, and 5968 to 6017 inclusive.

Takes interchangeable sets of pads as listed below 35.00

No. 22F Master Feeding Finger, for use with Outside Feeding Attachment on Nos. 2 and 2G Auto. having machine serial numbers from 5858 to 5967 inclusive, and from 6018 inclusive, up.

Takes interchangeable sets of pads as listed below 35.00

Pads for 22C, 22E and 22F Master Feeding Fingers:

Round: From 1 1-16″ to 1 3-8″, inclusive, by 16ths, sets of three	8.00
Hexagonal: From 1″ to 1 3-16″, inclusive, by 16ths, sets of three	10.00
*Square: From 3-4″ to 15-16″, inclusive, by 16ths, sets of four	11.25
*Metric: Round from 26 mm to 35 mm, inclusive, sets of three	9.00

No. 4 Automatic Screw Machine

No. 24M Master Spring Collets: (Slotted three times for round and hexagonal stock, four times for square stock.)

Round or Hexagonal: Takes interchangeable sets of pads for any size round stock to and including 1 1-2″ diameter, and any size hexagonal stock to and including 1 5-16″ 24.00

Square: Takes interchangeable sets of pads for any size square stock to and including 1 5-16″ 26.50

Pads for No. 24M Master Spring Collets:

Round: Any size to and including 1 1-2″, by 16ths, sets of three	12.00
*Hexagonal: To and including 1 5-16″, sets of three	15.00
*Square: Any size to and including 1 5-16″, sets of four	15.00

No. 24M Master Feeding Fingers: (Slotted three times for round or hexagonal stock, four times for square stock.)

Round or Hexagonal: Takes interchangeable sets of pads for any size round stock to and including 1 1-4″ diameter, and any size hexagonal stock to and including 1 1-16″ 18.00

Square: Takes interchangeable sets of pads for any size square stock to and including 1 1-16″ 20.50

*Made to order. List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

Master Spring Collet and Set of Pads

	Price, Each
Pads for No. 24M Master Feeding Fingers:	
Round: Any size to and including 1 1-4″, by 16ths, sets of three	$7.25
*Hexagonal: To and including 1 1-16″, sets of three	9.50
*Square: Any size to and including 1 1-16″, sets of four	9.50
No. 24 Feeding Fingers (Regular Style):	
Round: Any size from 1 5-16″ to 1 1-2″, inclusive, by 16ths	17.00
*Hexagonal: Any size from 1 1-8″ to 1 5-16″, inclusive	21.25
***Feed Tube Bushings:**	
Used in rear end of feed tube for steadying and supporting the bar. Round bushings used for round, square, or hexagonal stock. In specifying size wanted, add 1-32″ to diameter or distance across corners of stock.	
Round: 25-32″ to 1 17-32″, inclusive, by 16ths	5.25
No. 24 Spring Collets, for use with Outside Feeding Attachment:	
Round: Any size from 1 9-16″ to 1 7-8″, inclusive, by 16ths	21.25
*Hexagonal: Any size from 1 3-8″ to 1 5-8″, inclusive	27.00
*Square: Use No. 24M Master Spring Collet for square stock.	
No. 24MC Master Feeding Fingers, for use with Outside Feeding Attachment:	
Round: Takes interchangeable sets of pads for any size round stock from 1 9-16″ to 1 7-8″, inclusive	26.00
Hexagonal: Takes interchangeable sets of pads for any size hexagonal stock from 1 3-8″ to 1 5-8″, inclusive	26.00
Square: Takes interchangeable sets of pads for any size square stock from 1 1-8″ to 1 5-16″, inclusive	26.00
Pads for No. 24MC Master Outside Feeding Fingers:	
Round: From 1 9-16″ to 1 7-8″, inclusive, sets of three	9.50
*Hexagonal: From 1 3-8″ to 1 5-8″, inclusive, sets of three	12.15
*Square: From 1 1-8″ to 1 5-16″, inclusive, sets of four	12.15
No. 24MD Master Feeding Fingers, for use with Outside Feeding Attachment:	
Round: Takes interchangeable sets of pads for any size round stock from 1 9-16″ to 1 7-8″, inclusive	26.00
Hexagonal: Takes interchangeable sets of pads for any size hexagonal stock from 1 3-8″ to 1 5-8″, inclusive	26.00
Square: Takes interchangeable sets of pads for any size square stock from 1 1-8″ to 1 5-16″, inclusive	26.00

*Made to order only. List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

Set of Pads — Master Feeding Finger — Feed Tube Bushing

	Price, Each
Pads for No. 24MD Master Outside Feeding Fingers:	
Round: From 1 9-16″ to 1 7-8″, inclusive, by 1-16ths, sets of three	$9.50
*Hexagonal: From 1 3-8″ to 1 5-8″, inclusive, sets of three	12.15
*Square: From 1 1-8″ to 1 5-16″, inclusive, sets of four	12.15

No. 6 Automatic Screw Machine

No. 26M Master Spring Collets: (Slotted three times for round and hexagonal stock, four times for square stock.)

Round or Hexagonal: Takes interchangeable sets of pads for any size round stock to and including 2″ diameter, and any size hexagonal stock to and including 1 3-4″ 27.75

Square: Takes interchangeable sets of pads for any size square stock to and including 1 11-16″ 30.00

Pads for No. 26M Master Spring Collets:

Round: 3-4″ to and including 2″, by 1-16ths, sets of three 10.75

*Hexagonal: Any size to and including 1 3-4″, sets of three 14.90

*Square: Any size to and including 1 11-16″, sets of four 14.90

No. 26M Master Feeding Fingers: (Slotted three times for round and hexagonal stock, four times for square stock.)

Round or Hexagonal: Takes interchangeable sets of pads for any size round stock to and including 1 3-4″ diameter, and any size hexagonal stock to and including 1 1-2″ 20.40

Square: Takes interchangeable sets of pads for any size square stock to and including 1 7-16″ 22.80

Pads for No. 26M Master Feeding Fingers:

Round: 3-4″ to and including 1 3-4″, by 1-16ths, sets of three . . . 6.50

*Hexagonal: Any size to and including 1 1-2″, sets of three 9.50

*Square: Any size to and including 1 7-16″, sets of four 9.50

No. 26 Feeding Fingers (Regular Style):

Round: Any size from 1 13-16″ to 2″, inclusive, by 1-16ths 17.00

*Hexagonal: Any size from 1 9-16″ to 1 3-4″, inclusive 23.50

*Made to order only. List continued on next page. Other sizes made to order.

Spring Collets and Feeding Fingers (*Continued*)

Price, Each

Feed Tube Bushings:

Used in rear end of feed tube for steadying and supporting the bar. Round bushings used for round, square, or hexagonal stock. **In specifying size wanted, add 1-32″ to diameter or distance across corners of stock.**

Round: 25-32″ to 2 1-32″, inclusive, by 1-16ths $5.00

No. 26 Spring Collets, for use with Outside Feeding Attachment:

Round: Any size from 2 1-16″ to 2 3-8″, inclusive 21.00
*Hexagonal: Any size from 1 13-16″ to 2″, inclusive 29.25
Square: Use No. 26M Master Spring Collet for square stock.

No. 26MC Master Feeding Fingers, for use with Outside Feeding Attachment:

Round: Takes interchangeable sets of pads for any size round stock from 2 1-16″ to 2 3-8″, inclusive 30.00
Hexagonal: Takes interchangeable sets of pads for any size hexagonal stock from 1 13-16″ to 2″, inclusive 30.00
Square: Takes interchangeable sets of pads for any size square stock from 1 1-2″ to 1 11-16″, inclusive 30.00

Pads for No. 26MC Master Feeding Fingers:

Round: Any size from 2 1-16″ to 2 3-8″, inclusive, by 1-16ths, sets of three 10.25
*Hexagonal: Any size from 1 13-16″ to 2″, inclusive, sets of three . 13.15
*Square: Any size from 1 1-2″ to 1 11-16″, inclusive, sets of four . . 13.15

No. 26MD Master Feeding Fingers, for use with Outside Feeding Attachment:

Round: Takes interchangeable sets of pads for any size round stock from 2 1-16″ to 2 3-8″, inclusive 30.00
Hexagonal: Takes interchangeable sets of pads for any size hexagonal stock from 1 13-16″ to 2″, inclusive 30.00
Square: Takes interchangeable sets of pads for any size square stock from 1 1-2″ to 1 11-16″, inclusive 30.00

Pads for No. 26MD Master Feeding Fingers:

Round: Any size from 2 1-16″ to 2 3-8″, inclusive, by 1-16ths, sets of three 10.25
*Hexagonal: Any size from 1 13-16″ to 2″, inclusive, sets of three . 13.15
*Square: Any size from 1 1-2″ to 1 11-16″, inclusive, sets of four . . . 13.15

*Made to order only. Other sizes made to order.

Extra Capacity Collets

Special Collets or Chucks can be provided for Plain, Wire Feed and Automatic Screw Machines for holding on the spindle work of considerably larger diameter than the rated bar capacity of the machines. They are intended primarily for chucking pieces cut from the bar, pressed work and pieces already partly finished in another machine.

Capacity: No. 0 Wire Feed, 1 3-4″ diameter by 3-8″ deep; No. 1 Wire Feed, 2 1-2″ diameter by 7-16″ deep; Nos. 2 and 2F Wire Feed and 2 and 2G Automatic, 3″ diameter by 1-2″ deep; Nos. 00 and 00G Automatic, 1 3-8″ diameter by 1-4″ deep; Nos. 0 and 0G Automatic, 2″ diameter by 3-8″ deep; No. 4 Automatic, 4″ diameter by 1-2″ deep; No. 6 Automatic, 5″ diameter by 5-8″ deep; Nos. 4 Plain and 4 Wire Feed, 6″ diameter by 9-16″ deep; Nos. 6 Plain and 6 Wire Feed, 7″ diameter by 5-8″ deep.

As these collets are intended only for special work, it is necessary for us to have details regarding the work to be done before quoting prices.

Spring Collets—*Taper Nose*

For Automatic Screw Machines

Nos. 00 and 00G High Speed Automatic Screw Machines

No. 00B Spring Collets:	Price, Each
Round: 3-16″, 13-64″, 7-32″, 15-64″, 1-4″, 17-64″, 9-32″, 19-64″, 5-16″, 21-64″, 11-32″, 23-64″, 3-8″, 7-16″	$4.00
Square: 1-4″, 5-16″	8.00
Hexagonal: 1-4″, 9-32″, 5-16″, 11-32″, 3-8″	8.00
*Metric, Round: Any size from 5 mm to 12 mm, inclusive	4.50
Collet Blanks	2.35

Nos. 0 and 0G High Speed Automatic Screw Machines

No. 11B Spring Collets:	
Round: 5-16″, 21-64″, 11-32″, 23-64″, 3-8″, 25-64″, 13-32″, 27-64″, 7-16″, 29-64″, 15-32″, 31-64″, 1-2″, 33-64″, 17-32″, 35-64″, 9-16″, 37-64″, 19-32″, 39-64″, 5-8″	4.75
Square: 5-16″, 3-8″	8.00
Hexagonal: 5-16″, 3-8″, 7-16″, 1-2″	8.00
*Metric, Round: Any size from 8 mm to 15 mm, inclusive	5.35
Collet Blanks	2.65

*Made to order only.

Extra Size Feed Tubes and Fingers

For Wire Feed and Automatic Screw Machines

These feed tubes and fingers are somewhat lighter in construction than those regularly furnished with the machines. As they allow stock to be used of larger diameter than the rated capacity of the machines, they are offered for use only on brass or other work requiring comparatively light cuts. Be sure to give serial number of machine.

No. of Mach.	Machine Serial No.	Largest Diameter of Stock, Inches			Fingers, How Attached	Tube without Finger, Price	Tube with Round Finger, Price
		Round	Hex. Flats	Square			
W. F.							
**0	96 to 371	17-32	29-64	3-8	One Piece		$19.50
	96 to 371	1-2	7-16	23-64	Soldered	$12.00	15.00
	begin 372	1-2	7-16	23-64	Threaded	16.00	19.00
†0	begin 1394	1-2	7-16	23-64	Threaded	24.00	27.00
**1	prior to 227	9-16	1-2	13-32	Soldered	12.00	15.00
	prior to 227	5-8	17-32	29-64	One Piece		19.50
	227 to 495	3-4	21-32	35-64	Soldered	13.75	16.75
	begin 496	3-4	21-32	35-64	Threaded	18.50	21.50
†1	begin 1526	3-4	21-32	35-64	Threaded	36.00	39.00
2 and2F	prior to 383	1	7-8	23-32	Soldered	25.50	29.25
	383 to 863	1 1-16	15-16	3-4	Soldered	25.50	29.25
	begin 864	1 1-8	31-32	25-32	Threaded*	35.50	40.25
†2	begin 1935	1 1-8	31-32	25-32	Threaded*	60.25	65.00
Auto.							
00, 00G	prior to 3448, prior to 3098	3-8	21-64	17-64	Soldered	9.75	12.00
00, 00G	3448 to 9208, 3098 to 9148	3-8	21-64	17-64	Threaded	9.75	12.00
00, 00G	begin 9209, begin 9149	3-8	21-64	17-64	Threaded	16.00	18.25
0, 0G	prior to 2015, prior to 2215	9-16	1-2	13-32	Soldered	12.00	15.00
0, 0G	prior to 2015, prior to 2215	5-8	17-32	29-64	One Piece		19.50
0, 0G	2015 to 5690, 2215 to 5464	5-8	17-32	29-64	Threaded	12.00	15.00
0, 0G	begin 5691, begin 5466	5-8	17-32	29-64	Threaded	20.00	23.00
1		11-16	39-64	1-2	Soldered	16.00	19.00
1		3-4	21-32	35-64	One Piece		23.00

*Special chuck nut and chuck sleeve are included with feed tube.
**Not for Motor Drive Machines. †For Motor Drive Machines only.

Extra Size Feed Tubes and Fingers (*Continued*)

No. of Mach.	Machine Serial No.	Largest Diameter of Stock, Inches			Fingers, How Attached	Tube without Finger, Price	Tube with Round Finger, Price
		Round	Hex. Flats	Square			
2 2G	prior to 2255 prior to 2205	1 1-16	15-16	3-4	Soldered	$25.50	$29.25
2 2G	2255 to 5410 2205 to 5510	1 1-8	31-32	25-32	Threaded*	35.50	40.25
2 2G	begin 5411 begin 5511	1 1-8	31-32	25-32	Threaded*	45.00	49.75

*Special Chuck Nut and Chuck Sleeve are included with Feed Tube.

Chromium Plated Feeding Fingers

For Automatic and Wire Feed Screw Machines

These fingers are Chrome Plated to provide longer life than fingers of the regular type:

Nos. 00, 00G and 19 Automatic

	Price, Each
No. 00-X Feeding Fingers:	
Round: 1-8″ to 5-16″, inclusive, by 32nds	$2.70
Hexagonal: 3-16″ and 1-4″	4.80
No. 00A-X Feeding Fingers:	
Round: 11-32″ and 3-8″	2.70
Hexagonal: 5-16″	4.80

Nos. 0 and 0G Automatic and No. 1 Wire Feed (Prior to Machine Serial No. 227)

No. 11-X Feeding Fingers:	
Round: 3-16″ to 1-2″, inclusive, by 16ths	3.60
Hexagonal: 5-16″, 3-8″ and 7-16″	5.10

Nos. 0 and 0G Automatic

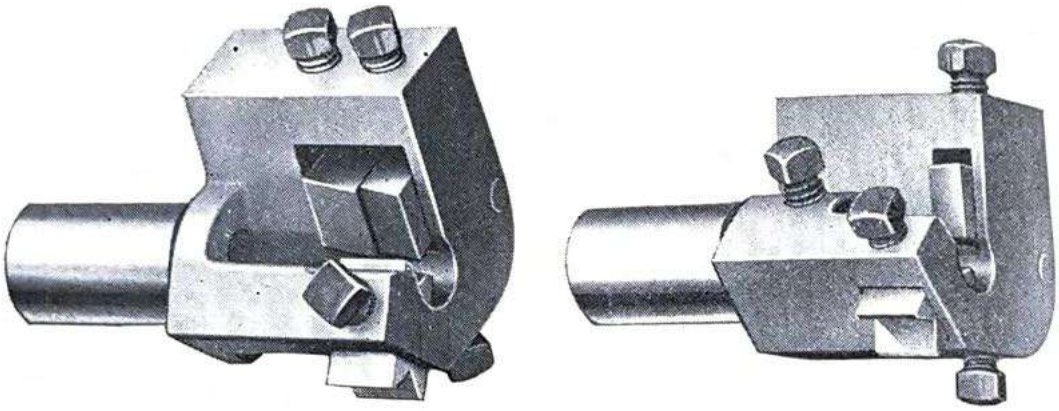
No. 11A-X Feeding Fingers:	
Round: 9-16″ and 5-8″	3.60
Hexagonal: 1-2″	5.10

Nos. 2 and 2G Automatic and Nos. 2 and 2F Wire Feed (Commencing with Machine Serial No. 383)

No. 22-X Feeding Fingers:	
Round: 1-2″ to 1″ by 16ths	4.50
Hexagonal: 1-2″ to 7-8″ by 8ths	5.70

Box Tools

STYLE 1



This style of box tool is used for general work, for turning one or two diameters as required. When one diameter is being turned with a tool carrying two blades, the blade in the rear is pushed back out of action.

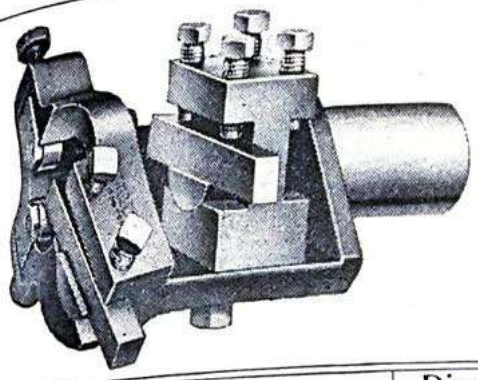
The back rests are beveled on both ends to increase their capacity, one end being for work of small diameter and the other for large work. Plain V rests only are used on this style.

Nos. 00B, 00C, 00D and 20C are equipped with one blade; all the others have two blades. One set of blades and back rests is furnished.

Nos. 00C, 20, 20A, 20B, 20C, 22A and 22B are arranged to hold a center drill or pointing tool in the shank, clamped in position by a set screw. A center drill is furnished with the No. 00C.

No.	No. of Machine where used	Diam., that can be turned, Inches	Length that can be turned, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
00	00, 00G and 19 Auto.	1-4	1 1-4	1 3-8	5-8	1 3-8	$16.00
‡00A	00, 00G and 19 Auto.	1-4	1 1-4	1 3-8	5-8	1 3-8	19.00
00B	00, 00G and 19 Auto.	3-16	1 1-4	3-4	5-8	1 3-4	8.75
†00C	00, 00G and 19 Auto.	1-4	5-8	1 3-8	5-8	1 1-8	17.00
‡00D	00, 00G and 19 Auto.	3-16	1 1-4	3-4	5-8	1 3-4	12.00
20	0 and 0G Automatic	1-2	1 5-8	2 3-16	3-4	1 1-2	19.00
‡20A	0 and 0G Automatic	1-2	1 5-8	2 3-16	3-4	1 1-2	23.50
20B	0 and 0G Automatic	1-4	2	2 3-16	3-4	1 1-2	17.75
20C	0 and 0G Automatic	1-2	3-4	1 1-4	3-4	1 1-2	19.00
‡22A	2 and 2G Automatic	5-8	2	2 5-8	1	2 1-4	30.00
22B	2 and 2G Automatic	5-8	2	2 5-8	1	2 1-4	27.50

†With Center Drill. ‡Left-Hand.



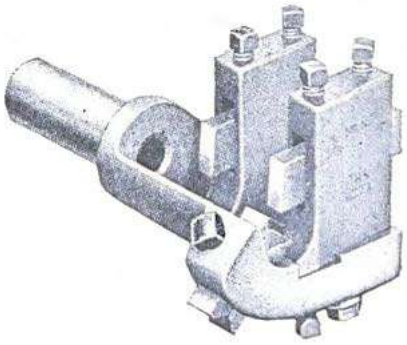
Box Tools—STYLE 2

These tools have roller back rests for front blades and plain V rests for rear. Rollers are adjustable for different diameters. Plain rests are beveled on both ends. The rear tool holder is adjustable along the body of the box tool. One set of blades and back rests is furnished.

No.	No. of Machine where used	Diam. that can be turned, Inches	Length that can be turned, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
12	2 & 2 F W.F.; 2 Pl.	1	3 1-2	4 3-16	1	2 1-2	$60.00
*12B	2 & 2 F W.F.; 2 Pl.	1	3 1-2	4 3-16	1	2 1-2	66.00
14	4 Pln., 428 to 601** 4 W.F. prior to 23**	1 1-4	4 1-2	5 1-4	1 1-2	3 1-4	75.00
34	4 Plain; 4 W.F. 5 Plain	1 1-4 1 1-8	4 1-2 8	5 1-4	1 3-4	3 1-4	75.00
16	5 Pln., 428 to 581** 6 Pln., 59 to 230**	1 1-2	5	5 9-16	1 1-2	3 1-4	90.00
36	6 Plain; 6 W.F.	1 1-2 1 3-8	5 10	5 9-16	2	3 1-4	90.00

*Left-Hand. **Be sure to give serial number of machine.

Box Tools—STYLE 3



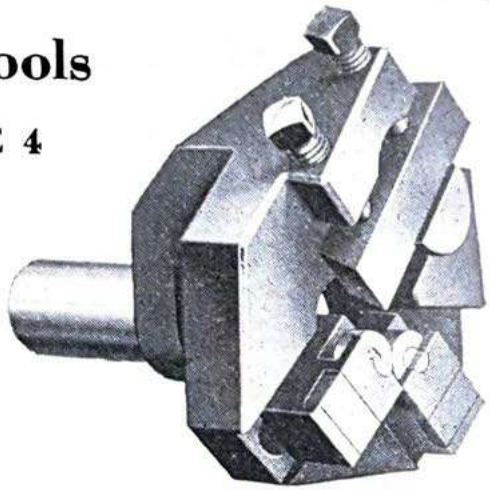
Front tool holder is fixed; rear tool holder is adjustable along body of tool. Holders are narrow so tools may be set close together when desired. Back rest is beveled on one end for large diameters and on the other for small. No. 22 Box Tool has 3 tool holders with back rests and is arranged to hold a center drill or pointing tool in the shank. The drill is not included in price of tool. One set of blades and back rests is furnished.

No.	No. of Machine where used	Diam. that can be turned, Inches	Length that can be turned, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
20D	0 & 0G Automatic	3-8	2	2 3-16	3-4	1 1-2	$27.50
22	2 & 2G Automatic	7-8	2 3-8	3	1	2	35.50
10	0 Wire Feed	3-8	1 3-4	2 3-16	5-8	1 7-16	27.50
*10A	0 Wire Feed	3-8	1 3-4	2 3-16	5-8	1 7-16	30.00
11	1 W.F.; 1 Plain	1-2	2 1-4	2 11-16	3-4	2	27.50
*11A	1 W.F.; 1 Plain	1-2	2 1-4	2 11-16	3-4	2	30.00
13		1	3	3 3-4	1 1-4	3 1-4	43.00

*Left-Hand.

Box Tools

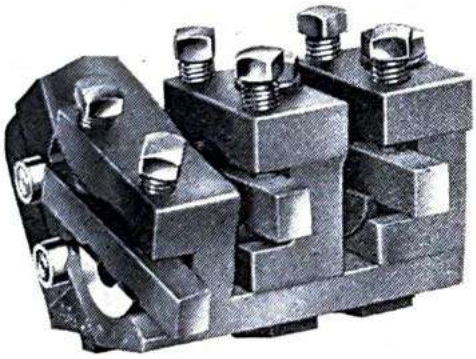
STYLE 4



The blade is in a fixed position and the back rests adjustable. The back rests are of the roller type to reduce friction. This tool is intended for work requiring one cut only.

No.	No. of Machine where used	Turning Capacity, Diam., In.	Length that can be turned, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
00E	00, 00G and 19 Auto.	3-32 to 5-16	1 1-4	1 7-16	5-8	1 3-8	$34.00
*00F	00, 00G and 19 Auto.	3-32 to 5-16	1 1-4	1 7-16	5-8	1 3-8	38.00
10E	0 Wire Feed	3-32 to 3-8	1 3-4	2 3-16	5-8	1 7-16	43.00
*10F	0 Wire Feed	3-32 to 3-8	1 3-4	2 3-16	5-8	1 7-16	47.50
11E	1 Wire Feed	3-16 to 1-2	2 1-4	2 11-16	3-4	2	52.00
*11F	1 Wire Feed	3-16 to 1-2	2 1-4	2 11-16	3-4	2	57.00
20E	0 and 0G Auto.	3-16 to 5-8	1 5-8	2 3-16	3-4	1 1-2	43.00
*20F	0 and 0G Auto.	3-16 to 5-8	1 5-8	2 3-16	3-4	1 1-2	48.00
22E	2 and 2G Auto.	5-16 to 7-8 5-16 to 5-8	2 3-8 3	3	1	2	52.00
*22F	2 and 2G Auto.	5-16 to 7-8 5-16 to 5-8	2 3-8 3	3	1	2	58.00

*Left-Hand.

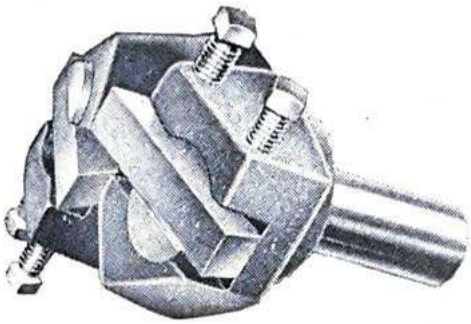


These tools have blades providing means for turning as many as three diameters at once when required. Two of the blades are sometimes used for turning and the third for pointing. The two rear tool holders are adjustable along the tool body and may be reversed.

The work is supported by a roller back rest opposite the front blade, and a plain V rest between the rear blades.

No.	No. of Machine where used	Turning Capacity, Diameter, Inches	Price
24	4 Automatic	3-8 to 1 1-2	$90.00
26	6 Automatic	1-2 to 1 3-4	100.00

Balance Turning Tools



Intended for roughing cut only with one blade set to remove one-half the chip, the opposite blade set to the roughing size and ground slightly behind the other. Tools are fitted with high speed steel blades.

No.	No. of Machine where used	Diam. that can be turned, Inches	Length that can be turned, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
*00A	00, 00G and 19 Auto.	11-32	1 1-4	1	5-8	1 3-8	$24.00
00B	00, 00G and 19 Auto.	11-32	1 1-4	1	5-8	1 3-8	24.00
10	0 Wire Feed	3-8	2	2 3-16	5-8	1 7-16	25.00
*10A	0 Wire Feed	3-8	2	2 3-16	5-8	1 7-16	27.50
11	1 W.F.; 1 Plain	5-8	2 1-2	2 3-4	3-4	2	29.00
*11A	1 W.F.; 1 Plain	5-8	2 1-2	2 3-4	3-4	2	32.00
12	2 and 2F W.F.; 2 Pln.	1	3 5-8	4 1-8	1	2 1-2	34.00
*12A	2 and 2F W.F.; 2 Pln.	1	3 5-8	4 1-8	1	2 1-2	37.50
20	0 and 0G Auto.	5-8	2	2 3-16	3-4	1 3-4	28.00
*20A	0 and 0G Auto.	5-8	2	2 3-16	3-4	1 3-4	28.00
20B	0 and 0G Auto.	11-32	2	2 1-4	3-4	1 3-4	24.00
22	2 and 2G Auto.	1	2 5-8	3	1	1 3-4	32.00
*22A	2 and 2G Auto.	1	2 5-8	3	1	1 3-4	32.00
34	4 W.F.; 4 Plain	1 1-2 15-16	1 3-4 8	5 1-4	1 3-4	3 1-4	38.00

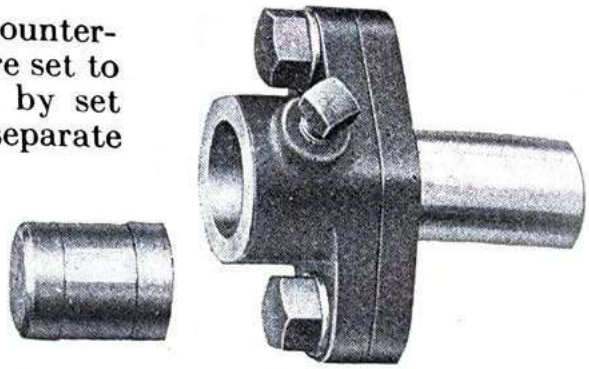
*Left-Hand.

The No. 36 Balance Turning Tool differs from the one shown in cut in that it screws on the face of the turret.

No.	No. of Machine where used	Diam. that can be turned, Inches	Length that can be turned, Inches	Method of Attaching	Price
24	No. 4 Auto.	1 1-2	4	Clamps on face of turret	$34.00
26	No. 6 Auto	2	5	Clamps on face of turret	38.00
36	6 W.F.; 6 Plain	1 15-16	10	Screws on face of turret	42.00

Floating Holders

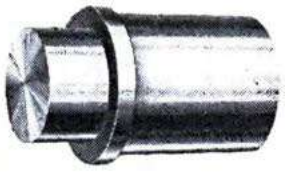
For holding drills, reamers, counterbores etc., in the turret. Tools are set to the proper length and clamped by set screw. The holder and shank are separate and, after the tool is adjusted concentric with the work, the two are clamped together. One blank bushing is furnished. Bushings listed, page 581.



No.	No. of Machine where used	Diam. of Hole for Drill or Bushing, Inches	Depth of Hole, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
00	00, 00G and 19 Auto.	5 Taper	5-8	15-16	5-8	1 1-8	$6.25
00A	00, 00G and 19 Auto.	1-2	11-16	27-32	5-8	1 1-8	6.25
10	0 Wire Feed	1-2	11-16	29-32	5-8	1 7-16	6.25
11	1 W.F. and 1 Plain	5-8	13-16	1 1-8	3-4	2	7.00
12	2&2F.W.F. and 2 Pl.	1	1 3-16	1 1-2	1	2 1-2	8.00
14	4 Plain 428 to 601* 4 W.F. prior to 23*	1	1 3-16	1 9-16	1 1-2	3 1-4	8.75
16	5 Plain 428 to 581* 6 Plain 59 to 230*	1 1-2	1 5-8	2 5-32	1 1-2	3 1-4	12.00
20	0 and 0G Auto.	5-8	13-16	1 1-8	3-4	2	7.00
22	2 and 2G Auto.	1	1 3-16	1 1-2	1	1 3-4	8.00
34	4 Plain and 4 W.F.	1 1-2	1 5-8	2 5-32	1 3-4	3	12.00
36	6 Plain and 6 W.F.	1 1-2	1 5-8	2 5-32	2	3 1-4	12.00

*Be sure to give serial number of machine.

Slotting Bushing Blanks



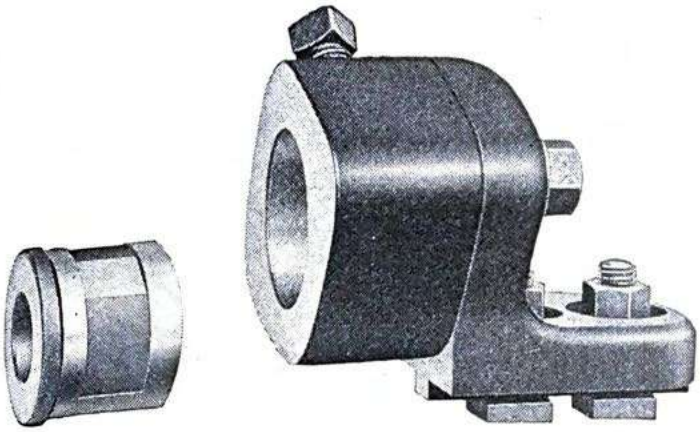
The bushing blanks are for use in the transporting arm of the various attachments, for carrying the piece of work from the spindle to the attachment. The blanks are finished to fit the transporting arm, so that it is only necessary to recess to hold the piece of work and slot for the ejector.

For use with Nos. 00 and 00G Automatic Screw Machines..... $0.45

For use with Nos. 0 and 0G Automatic Screw Machines..... 0.45

For use with Nos. 2 and 2G Automatic Screw Machines..... 0.55

Floating Holders



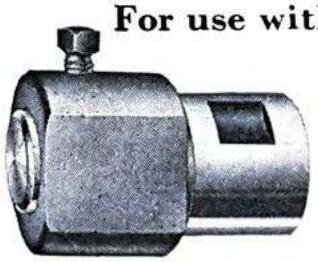
These Floating Holders hold drills, reamers etc., which can be set central with work, after which the floating head is clamped. One bushing blank is furnished.

Bushings listed, page 581.

No.	No. of Machine where used	Diam. of Hole for Bushing, Inches	Price of Holder
24	4 Automatic	1 3-4	$22.00
26	6 Automatic	2	22.00

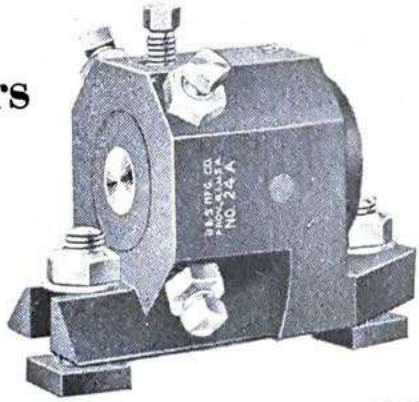
Floating Holder Extensions

For use with Nos. 24 and 26 Floating Holders



No.	No. of Machine where used	Diam. of Hole for Bushing, Inches	Price
24	4 Automatic	1 1-4	$10.00
26	6 Automatic	1 1-2	14.00

Floating Holders

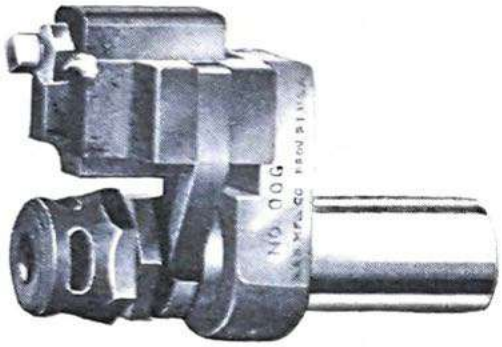


These Floating Holders hold drills, reamers etc., which centralize themselves with the work. One bushing blank is furnished. Bushings listed, page 581.

No.	No. of Machine where used	Diam. of Hole for Bushing, Inches	Price of Holder
24A	4 Automatic	3/4	$40.00
26A	6 Automatic	1	45.00

No. 00G Releasing Die Holder

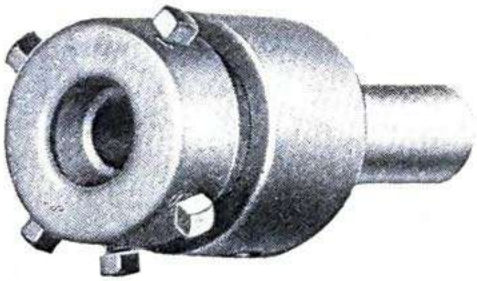
For use with Acorn Dies on Brown & Sharpe Automatic Screw Machines



These Holders for Acorn Dies are particularly recommended for use on Brown & Sharpe Automatic Screw Machines when it is desirable to hold thread within a definite length—as when threading close to a shoulder. Length of threading is governed by the adjustable screw on the front of the holder coming in contact with the chuck guard over the nose of the spindle.

No. of Holder	No. of Machine where used	Capacity		Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	No. of Die Used	Price without Dies
		Diam. of Thread, Inches	Length of Thread, Inches					
00G	00 and 00G Automatics	1-16 to 1-8	5-8	1 7-16	5-8	1 1-8	0	**$35.00**

Die Holders



Plain Draw-out Style

Die Holders are of two styles, either with or without a releasing arrangement. The holders without releasing arrangement are of the plain, draw-out type. The releasing type is of special advantage on hand operated machines, being provided with a clutch mechanism which allows the holder to be released without shock. The construction is simple and parts subject to wear are hardened.

See Lists, on next page.

Die Holders — Non-Releasing Style

No. of Holder	No. of Machine where used	Capacity: Diam. Thread, Inches	Capacity: Length Thread, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Dies Used Stock Sizes, Inches	Price without Dies
00E	00 & 00G Auto.	5-16	1	1 3-8	5-8	1 1-4	1/4 x 5/8 1/4 x 13/16	$9.75
*20	0 & 0G Auto.	3-8	1 1-4	1 3-4	3-4	1 3-4	1/4 x 13/16 5/16 x 1	9.75
*22	2 & 2G Auto.	1-2	1 3-4	2 3-8	1	2	5/16 x 1 1/2 x 1 1/2	12.00

*Extra capacity die caps and bushings can be furnished to take larger dies on these holders: for No. 20, takes a die 1/2" x 1 1/2"—$5.00; for No. 22, takes a die 5/8" x 2"—$6.00.

Releasing Style

No.	No. of Machine where used	Capacity: Diam. Thread, Inches	Capacity: Length Thread, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Dies Used Stock Sizes, Inches	Price without Dies
†00B	00 & 00G Auto.	1-4	3-4	1 7-16	5-8	1 1-8	1/4 x 5/8	$9.75
10	0 Wire Feed	9-32	1	1 11-16	5-8	1 7-16	1/4 x 5/8 1/4 x 13/16	9.75
†11	1 W.F.; 1 Plain	3-8	1	1 7-8	3-4	2	1/4 x 13/16 5/16 x 1	12.00
†12	2 and 2F W.F.; 2 Plain	1-2	2 3-8	2 3-8	1	2 1-2	5/16 x 1 1/2 x 1 1/2	16.00
13		3-4	2 1-2	3 1-4	1 1-4	3 1-4	1/2 x 1 1/2 5/8 x 2	29.50
14	4Pl.428to601* 4WF p'r to23*	3-4	2 1-2	3 1-4	1 1-2	3 1-4	1/2 x 1 1/2 5/8 x 2	31.00
16	5Pl.428to581* 6Pl.59to230*	1 1-16	2 3-4	3 5-8	1 1-2	3 1-4	5/8 x 2 11/16 x 2 1/2	39.00
†20B	0 and 0G Auto.	3-8	1	1 7-8	3-4	1 1-2	1/4 x 13/16 5/16 x 1	12.00
†22B	2 and 2G Auto.	1-2	2 3-8	2 3-8	1	2	5/16 x 1 1/2 x 1 1/2	16.00
34	4&5 Pl.;4 W.F.	1 13/16	2 3-4 8	3 5-8	1 3-4	3	5/8 x 2 11/16 x 2 1/2	39.00
36	6 Plain; 6 W.F.	1 1-2 1 1-16	3 1-8 10	4	2	3 1-4	5/8 x 2 11/16 x 2 1/2 1 1/16 x 3	50.00

*Be sure to give serial number of machine.

†Extra capacity die caps and bushings can be furnished to take larger dies on following holders: For Nos. 00B, takes die 1/4" x 13/16"—$3.00. For Nos. 11 and 20B, takes die 1/2" x 1 1/2"—$5.00; for Nos. 12 and 22B, takes die 5/8" x 2"—$6.00.

Releasing "Acorn" Die Holders

These holders for "Acorn" dies are especially recommended for use on hand operated machines. The clutch mechanism allows the holder to be released without shock. All parts subject to wear are carefully hardened.

All holders are listed for the largest size dies within their capacity. They can be furnished for certain smaller dies but the length of the body of the holder will be, in some cases, shorter than shown below. Prices on request.

No. of Hd'r.	No. of Machine where used	Capacity		Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	No. of Die Used	Price without Dies
		Diam. Thrd., Inches	Length will Thread, Inches					
731	00 & 00G Auto.	1-16 to 1-4	7-8	1 3-4	5-8	1 1-8	1	$12.50
732A	0 Wire Feed	1-4 to 5-16	1 3-8	2 1-4	5-8	1 7-16	2	12.50
732B	1 W.F.; 1 Plain	1-4 to 7-16	1 1-2	2 1-4	3-4	2	2	14.00
732C	0 & 0G Auto.	1-4 to 7-16	1 1-2	2 1-4	3-4	1 1-2	2	14.00
733A	2 & 2F W.F.; 2 Plain	3-8 to 1-2 1-2 to 5-8	*3 1-8 2 1-8	3 1-8	1	2 1-2	3	17.00
733B	2 & 2G Auto.	3-8 to 1-2 1-2 to 5-8	*3 1-8 2 1-8	3 1-8	1	2	3	17.00
733C		3-8 to 5-8	**2 7-8	3 9-16	1 1-4	3 1-4	3	32.00
734A	4 Pl.428to601§§ 4 W.F.p'rto23§§ 5 Pl.428to581§§ 6 Pl.59to230§§	5-8 to 1	3 5-8	4 3-8	1 1-2	3 1-4	4	38.00
734B	4&5 Pl.; 4 W.F.	5-8 to 1	†3 5-8	4 3-8	1 3-4	3	4	38.00
735	6 Plain; 6 W.F.	1 1-16 to 1 1-2	‡4	4 11-16	2	3 1-4	5	46.00

*½" diameter and smaller.

**Will cut 7/16" diameter and smaller threads of any length by feeding way through holder.

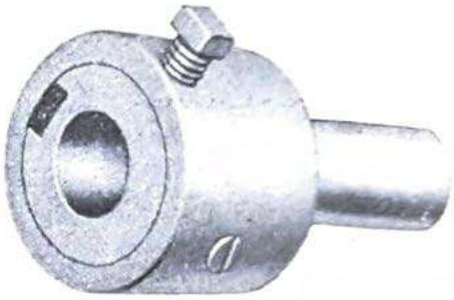
†Will cut ¾" diameter and smaller threads of any length by feeding way through holder.

‡Will cut 1 1/16" diameter and smaller threads of any length by feeding way through holder.

§§Be sure to give serial number of machine.

Tap Holders

Tap Holders are of two styles, either with or without a releasing arrangement. The holders without a releasing arrangement are of the plain, draw-out style. The releasing style is of special advantage on hand operated machines, being provided with a clutch mechanism which allows the holder to be released without shock. All parts are hardened. One blank bushing furnished. Bushings listed, page 581.



Plain Draw-out Style

Non-Releasing Style

No. of Holder	No. of Machine where used	Diameter of Hole for Tap or Bushing, Inches	Depth of Hole, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
00	00 and 00G Auto.	No. 5 Taper	5-8	15-16	5-8	1 1-8	$8.00
00A	00 and 00G Auto.	1-4	3-8	15-16	5-8	1 1-8	7.50
00C	00 and 00G Auto.	1-2	11-16	15-16	5-8	1 1-8	8.00
20	0 and 0G Auto.	5-8	13-16	1 7-16	3-4	1 1-2	8.75
22	2 and 2G Auto.	1	1 3-16	1 9-16	1	2	9.75

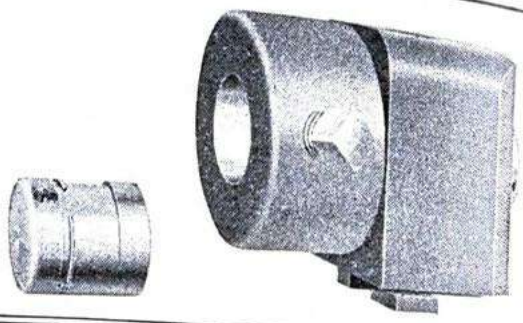
Releasing Style

No. of Holder	No. of Machine where used	Diam. Hole, Inches	Depth Hole, Inches	Length Body, Inches	Diam. Shank, Inches	Length Shank, Inches	Price
00B	00 and 00G Auto.	1-2	1-2	1 1-16	5-8	1 1-8	$9.50
10	0 Wire Feed	1-2	11-16	1 5-16	5-8	1 7-16	9.75
11	1 Wire Feed; 1 Plain	5-8	13-16	1 7-16	3-4	2	10.75
12	2&2 F Wire Feed; 2 Pl.	1	1 3-16	2	1	2 1-2	13.75
13		1	1 3-16	2 1-2	1 1-4	3 1-4	28.00
14	4 Plain 428 to 601* / 4 W.F. prior to 23*	1	1 3-16	2 1-2	1 1-2	3 1-4	28.00
16	5 Plain 428 to 581* / 6 Plain 59 to 230*	1 1-2	1 5-8	2 7-8	1 1-2	3 1-4	32.00
20B	0 and 0G Auto.	5-8	13-16	1 7-16	3-4	1 1-2	10.75
22B	2 and 2G Auto.	1	1 3-16	2	1	2	13.75
34	4 Plain; 4 Wire Feed	1 1-2	1 5-8	2 7-16	1 3-4	3	30.00
36	6 Plain; 6 Wire Feed	1 1-2	1 5-8	2 7-8	2	3 1-4	35.00

*Be sure to give serial number of machine.

Tap Holders

These tap holders are of the plain, draw-out type, the tap being held directly in the holder or in a bushing. One blank bushing, as shown in cut, is furnished. Bushings listed, page 581.



No.	No. of Machine where used	Size of Hole for Tap or Bushing, Inches	Price of Tap Holder
24	4 Automatic	1 1-4 diameter, 1 1-2 deep	$35.00
26	6 Automatic	1 1-2 diameter, 1 5-8 deep	45.00

Die Holders

These die holders are of the plain, draw-out type. Two caps are furnished with the No. 24 having inside diameters of 2″ and 2½″, and with the No. 26 three caps are furnished having inside diameters of 2″, 2½″ and 3″.

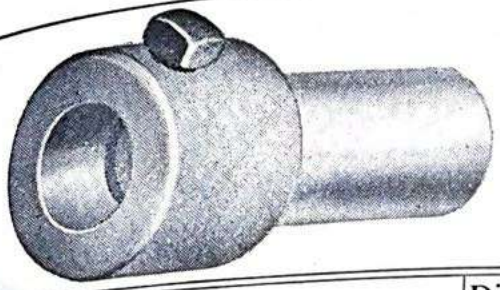
No.	No. of Machine where used	Threading Capacity, Inches	Price
24	4 Automatic	To 1 3-16 diam.	$38.00
26	6 Automatic	To 1 7-16 diam.	38.00

Stock sizes of dies used:
For No. 24—½″ x 1½″, ⅝″ x 2″, and 11/16″ x 2½″.
For No. 26—⅝″ x 2″, 11/16″ x 2½″, and 1 1/16″ x 3″.

Closers for Opening Die Holders

The Die Closer is attached to a finished pad provided for the purpose on the front of the Automatic Screw Machine. It can be adjusted to engage the pin on the Opening Die Holder and close the die as the turret is rotated after the threading operation.

No. 00 for use on Nos. 00 and 00G Automatic Screw Machines $7.00
No. 20 for use on Nos. 0 and 0G Automatic Screw Machines 8.50
No. 22 for use on Nos. 2 and 2G Automatic Screw Machines 10.00



Drill Holders

Drills are held directly in holder or in a bushing. One blank bushing furnished with each holder. Bushings listed below.

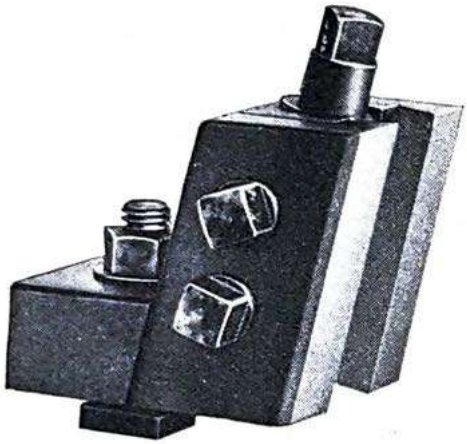
No.	No. of Machine where used	Dia. Hole for Drill or Bush.	Depth Hole, Inches	Length Body, Inches	Diam. Shank, Inches	Length Shank, Inches	Price
00	00 and 00G Auto.	5 Taper	5-8	7-8	5-8	1 1-8	$4.00
00A	00 and 00G Auto.	1-2″	11-16	7-8	5-8	1 1-8	4.00
10	0 Wire Feed	1-2	11-16	1	5-8	1 7-16	4.00
11	1 W.F. and 1 Plain	5-8	13-16	1 1-8	3-4	2	4.00
12	2 & 2 F W.F. & 2 Plain	1	1 3-16	1 5-8	1	2 1-2	6.25
14	4 Plain 428 to 601* 4 W.F. prior to 23*	1	1 3-16	1 7-8	1 1-2	3 1-4	7.00
16	5 Plain 428 to 581* 6 Plain 59 to 230*	1 1-2	1 5-8	2 1-4	1 1-2	3 1-4	8.00
20	0 and 0G Auto.	5-8	13-16	1	3-4	1 15-16	4.00
22	2 and 2G Auto.	1	1 3-16	1 7-16	1	1 3-4	6.25
34	4 Plain and 4 W.F.	1 1-2	1 5-8	2 1-4	1 3-4	3	8.00
36	6 Plain and 6 W.F.	1 1-2	1 5-8	2 1-4	2	3 1-4	8.00

*Be sure to give serial number of machine.

Bushings and Bushing Blanks

Tool is clamped when set screw in holder bears upon flat on bushing shoe. Blanks are turned to size and are provided with shoe for clamping tool.

No.	No. of Drill, Tap, Knurl or Floating Holders where used	Outside Diameter, Inches	Length, Inches	Finished Bushing, Price	Bushing Blank, Price
00	00	5 Taper	11-16	$2.20	$0.55
00A	00A Tap	1-4	7-16	2.20	.55
10	00C & 10 Tap, 00A & 10 Floating, 00A & 10 Drill	1-2	3-4	2.20	.55
00B	00B, 00 Knee Tool	1-2	9-16	2.20	.55
11	11, 20 & 20B Tap, 11 & 20 Floating, 11 & 20 Drill	5-8	7-8	2.20	.55
21	21, 22 Kn. Tl., 24A Fltg.	3-4	1	2.20	.65
12	12, 13, 14, 22, 22B, 34 Tap, 26A Fltg.	1	1 1-4	2.20	.65
14	24, 24 Flt. Hold. Ext.	1 1-4	1 5-8	3.00	.85
16	16, 34, 36, 26 26 Float. Holder, Ext.	1 1-2	1 3-4	3.00	.85
24	24 Knurl, 24 Fltg.	1 3-4	1 3-4	3.25	1.25
26	26 Fltg., 26 Knurl	2	1 7-8	3.25	1.25



Forming Tool Holders

Used on the front cross slide of Plain and Wire Feed Screw Machines for heavy forming cuts. The tool is adjusted vertically by a screw and is clamped firmly in position after adjustment by the two cap screws on the side of the holder.

No.	No. of Machine where used	Width of Tool, Inches	Thickness of Tool, Inches	Price
10-A	No. 0 Wire Feed	1	1-2	$22.00
10-B	No. 0 Wire Feed	1 1-4	9-16	22.00
11-B	No. 1 W.F.; 1 Plain	1 1-4	9-16	30.00
11-C	No. 1 W.F.; 1 Plain	1 3-4	9-16	30.00
12-C	No. 2 and 2 F W.F.; 2 Plain No. 4 Plain prior to 602*	1 3-4	25-32	35.00
12-E	No. 4 W.F. prior to 23* No. 5 Plain prior to 553*	2 3-4	3-4	40.00
16-D	No. 6 Plain 8 to 230 incl.*	2 1-2	1	45.00
16-F	No. 6 Plain 59 to 231*	4	1	60.00
34-E	No. 4 Plain and 4 W.F.	2 3-4	1 1-4	50.00
36-F	No. 6 Plain and 6 W.F.	4	1 1-2	60.00

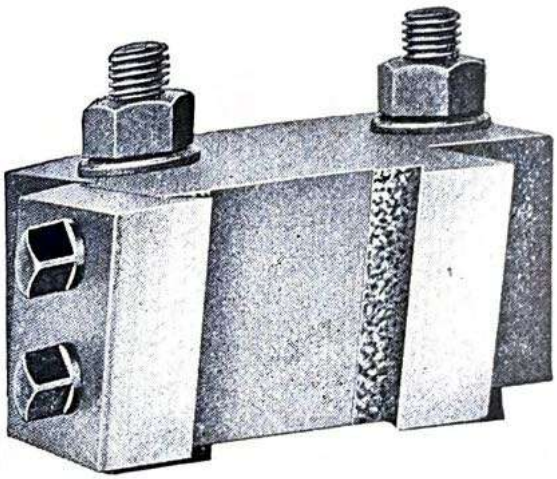
*Be sure to give serial number of machine.

Forming Tool Blanks

Dovetailed to fit the holder and when required have a series of slots milled in the back to receive the collar of the adjusting screw.

No.	Width, Inches	Thickness, Inches	Length, Inches	Carbon Steel, Price
10-A	1	1-2	1 1-2	$3.50
10-B	1 1-4	9-16	1 1-2	4.00
11-B	1 1-4	9-16	2	4.00
11-C	1 3-4	9-16	2	5.00
12-C	1 3-4	25-32	2 7-16	5.00
12-E	2 3-4	3-4	2 7-16	6.75
16-D	2 1-2	1	2 7-8	8.00
16-F	4	1	2 7-8	13.50
†34-E	2 3-4	1 1-4	2 7-16	6.25
	2 3-4	1 1-4	2 7-8	6.25
36-F	4	1 1-2	3 5-16	10.75

†Specify length wanted when ordering. For machines 3½" from center of spindle to top of cross slide use 2 7/16" length; for machines 3 15/16" from center of spindle to top of cross slide use 2 7/8" length.

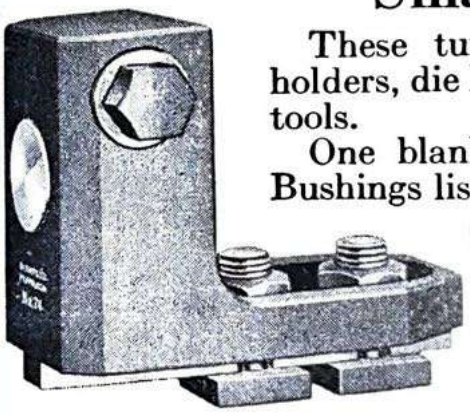


Forming Tool Holders

These forming tool holders are held on the front cross slide of the machine and are used on heavy forming operations. Dovetailed tool blanks for this holder are made to order.

No.	No. of Machine where used	Takes Tools, Inches	Price
24	4 Automatic	2 3-4 wide	$45.00
26	6 Automatic	4 wide	50.00

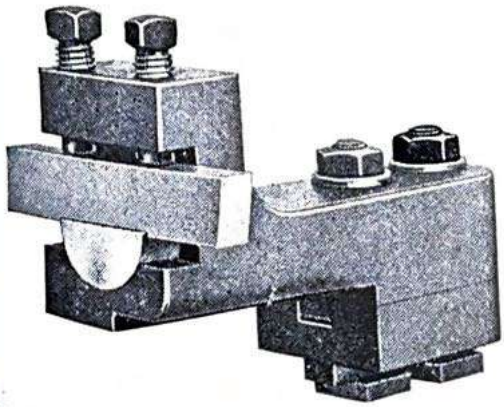
Small Turret Tool Holders



These turret holders are capable of holding tap holders, die holders or any of the small automatic turret tools.

One blank bushing is furnished with each holder. Bushings listed on page 581.

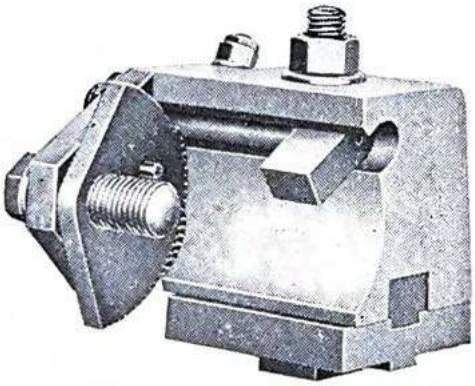
No.	No. of Machine where used	Diam. Hole for Tool Shank or Bushing, Inches	Price
24	4 Automatic	1	$20.00
26	6 Automatic	1 1-2	20.00



Turret Tool Posts

Nos. 24A and 26A Turret Tool Posts (short style) and Nos. 24B and 26B Turret Tool Posts (long style) are used either together or singly for turning operations. The raising block with each allows post to be used with spindle running in either direction. They will turn to capacity of machine. Other tools can often be used at same time in advance or in rear of these posts.

No.	No. of Machine where used	Price
24A	4 Automatic	$22.00
24B		32.00
26A	6 Automatic	22.00
26B		32.00



Tool Post with Worm Adjustment

Holds extra wide circular form tool. Tool adjusted and locked in position by a worm and sector. Hook bolt clamps the tool. The raising block furnished allows the post to be used with the spindle running in either direction. Tool blanks made to order.

No.	Number of Machine where used	Maximum Width of Tool, Inches	Maximum Diameter of Tool, Inches	Center of Spindle to Top of Cross Slide, Inches	Price
20 Front	0 and 0G Automatic	1 3-4	2 1-4	1 5-16	$58.00
22 Front	2 and 2G Automatic	2 1-4	3	1 7-16	58.00

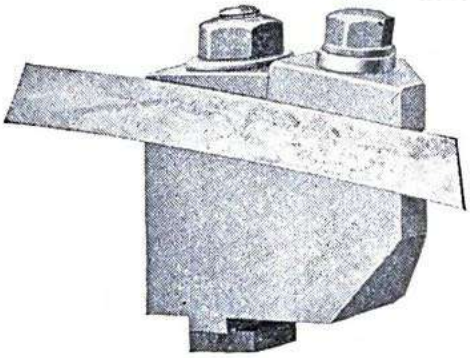
Circular Cutting-Off and Forming Tool Blanks

Blanks for Cutting-Off and Forming Tools are made of either Carbon or High Speed Steel. They are turned to size, drilled and tapped for clamping screw. Specify thickness when ordering.

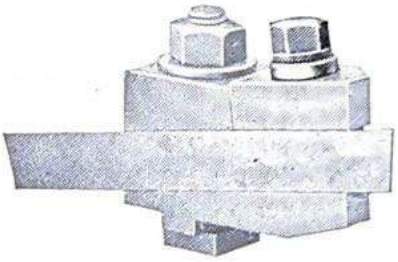
No. of Machine where used	Diam., Inches	Thickness, Inches	Carbon Steel, Price	High Speed Steel, Price
00, 00G and 19 Auto.	1 3-4	1-4 to 3-8 by 16ths	$0.90	$1.00
00, 00G and 19 Auto.	1 3-4	7-16 to 5-8 by 16ths	1.00	1.60
00, 00G and 19 Auto.	1 3-4	11-16 to 7-8 by 16ths	1.10	2.20
00, 00G and 19 Auto.	1 3-4	15-16 to 1 by 16ths	1.25	3.00
0 and 0G Automatic	2 1-4	1-4 to 3-8 by 16ths	1.25	1.50
0 and 0G Automatic	2 1-4	7-16 to 5-8 by 16ths	1.40	2.20
0 and 0G Automatic	2 1-4	11-16 to 7-8 by 16ths	1.60	2.80
0 and 0G Automatic	2 1-4	15-16 to 1 1-8 by 16ths	1.75	3.50
2 and 2G Automatic	3	1-4 to 3-8 by 16ths	2.00	2.60
2 and 2G Automatic	3	7-16 to 5-8 by 16ths	2.30	3.20
2 and 2G Automatic	3	11-16 to 7-8 by 16ths	2.60	4.00
2 and 2G Automatic	3	15-16 to 1 1-4 by 16ths	3.00	4.80
4 Automatic	3 1-2	1-2, 5-8, 3-4, 7-8	5.60	7.00
4 Automatic	3 1-2	1, 1 1-4, 1 1-2	6.75	9.00
4 Automatic	3 1-2	1 3-4, 2	8.50	13.00
6 Automatic	4	1-2, 5-8, 3-4, 7-8	6.25	8.00
6 Automatic	4	1, 1 1-4, 1 1-2	7.25	10.00
6 Automatic	4	1 3-4, 2	9.25	14.00
6 Automatic	4	2 1-4, 2 1-2	12.00	18.00
6 Automatic	4	2 3-4	13.75	22.00

Cutting-Off Tool Posts

For Thin Blade Tools



High Back



Low Back

One blade is furnished with each post. High, for back cross slide, and low, for front cross slide, are used when spindle runs forward. Low for back cross slide is used when spindle runs backward.

No.	Style	No. of Machine where used	Top of Cross Slide to Center of Spindle, Inches	Price
00	High back, low back, low front	00 and 00G Auto.	1	$8.00
10	High back, low back	0 Wire Feed	1 9-16	10.75
11	High back, low back	1 W.F. and 1 Plain	2 1-16	12.00
12	High back, low back	2 and 2F W.F. and 2 Plain 4 W.F. prior to 23* 4 Pl. prior to 602* 5 Pl. prior to 553*	2 1-2	13.00
16	High back	6 Plain 8 to 230*	2 15-16	13.75
20	High back, low back, low front	0 and 0G Auto.	1 5-16	9.75
22	High back, low back, low front	2 and 2G Auto.	1 7-16	13.75

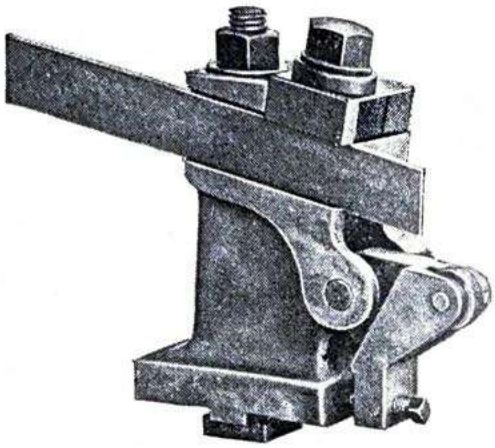
*Be sure to give serial number of machine.

Blades

For Cutting-Off Tool Posts and Vertical Slides

For Post No.	Thickness, Inches	Width, Inches	Price, Each	
			Carbon Steel	High Speed Steel
00	1-32	1-2	$0.45	$1.50
00	1-16, 5-64, 3-32	1-2	.45	1.25
10	1-16, 3-32, 1-8	11-16	.45	1.25
11, 12 and 16	1-16, 3-32, 1-8	13-16	.55	1.25
	5-32		.60	1.25
	3-16		.65	1.25
20 and 22	1-16, 3-32, 1-8	11-16	.45	1.25
For No. 4 Auto.	3-16	13-16	.65	1.25
For No. 6 Auto.	3-16	1	.75	1.50

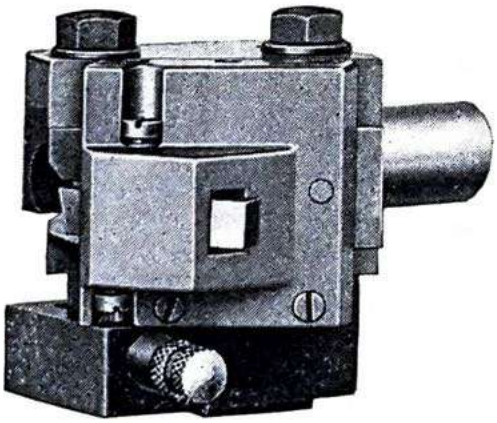
Combination Cutting-Off and Knurling Tool Posts



These posts are used on the back cross slide of Plain and Wire Feed Screw Machines for cross knurling and cutting off. The knurl passes under the work and the spindle must be running forward. One blade and straight knurl are furnished. For blades see list, page 585.

No.	No. of Machine where used	Top of Cross Slide to Center of Spindle, Inches	Price
10	No. 0 Wire Feed	1 9-16	$30.00
11	No. 1 Wire Feed	2 1-16	35.00
12	No. 2 and 2F W.F. and 2 Plain No. 4 Pl. prior to 602* No. 5 Pl. prior to 553*	2 1-2	40.00

*Be sure to give serial number of machine.



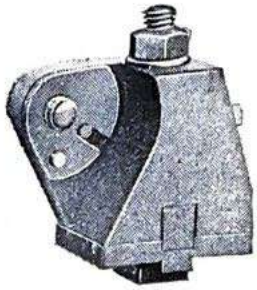
Angular Cutting-Off Tools

The Angular Cutting-Off Tool is held in the turret and operated by a Fixed or Adjustable Guide on the front cross slide. It is used when it is desired to form the end of the work cone-shaped and to produce a clean-cut sharp point when cut off. It is adjustable for any included angle within its capacity.

No.	No. of Machine where used	Total Inc. Angle	Diameter Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00	00, 00G, 19	50° to 80°	5-8	1 1-8	2 1-8	$80.00
20	0 and 0G	50° to 80°	3-4	1 3-8	2 5-8	115.00
22	2 and 2G	50° to 80°	1	1 3-4	3 5-16	150.00

Price does not include Fixed or Adjustable Guide.

Tool Posts for Circular Tools

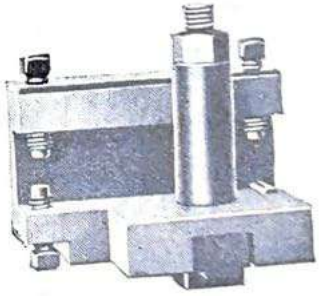


They are provided with tool adjustment, also a raising block so they may be used with the spindle running in either direction. In ordering, be sure to state whether to be used on front or back slide. Circular Form Tool Blanks for these posts made to order.

No.	No. of Machine where used	Max'm Diam., Inches	Max'm Width, Inches	Top of Cross Slide to Center of Spindle, Inches	Price, Each
10 Front 10 Back	0 Wire Feed	1 3-4	3-4	1 9-16	$24.00
11 Front 11 Back	1 Wire Feed	2 1-4	1 1-4	2 1-16	26.00
12 Front 12 Back	2and2FW.F.and2Plain 4 Plain prior to 602* 5 Plain prior to 553*	3	1 3-4	2 1-2	27.50
**34 Front **34 Back	4 Plain and 4 Wire Feed	4	2	3 15-16	85.00
**36 Front **36 Back	6 Plain and 6 Wire Feed	4	2 1-2	4 7-16	90.00

*Be sure to give serial number of machine. **Has worm adjustment.

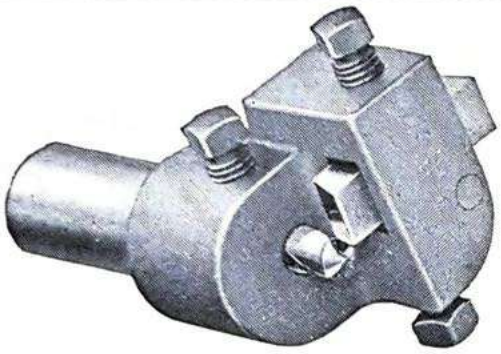
Tool Posts for Square Tools



For holding square tools on Automatic Screw Machines.

Means are provided for vertical adjustment of the tool. Cuts only when spindle is running one way.

No.	No. of Machine where used	Top of Cross Slide to Center of Spindle, Inches	Size of Tool		Price, Each
			Height, Inches	Width, Inches	
00 Front 00 Back	00, 00G and 19 Auto.	1	5-16	7-16	$18.00
20 Front 20 Back	0 and 0G Automatic	1 5-16	1-2	5-8	23.50
22 Front	2 and 2G Automatic	1 7-16	5-8	7-8	31.50
22 Back	2 and 2G Automatic	1 7-16	5-8	1-2	31.50



Centering and Facing Tools

The Centering and Facing Tool is used in the turret when the stock stop is not used. It faces the stock to the required length and at the same time centers it to insure concentric drilling. One turning blade and centering tool furnished.

No.	No. of Machine where used	Diam. of Drill, Inches	Length of Body, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
00	00, 00G and 19 Auto.	1-4	1 3-8	5-8	1 3-8	$8.00
*00C	00, 00G and 19 Auto.	1-4	1 3-8	5-8	1 3-8	8.00
10	0 Wire Feed	5-16	1 9-16	5-8	1 7-16	9.75
*10A	0 Wire Feed	5-16	1 9-16	5-8	1 7-16	13.00
11	1 Wire Feed; 1 Plain 0 and 0G Auto.	3-8	1 11-16	3-4	2	9.75
*11A	1 W. F.; 1 Plain 0 and 0G Auto.	3-8	1 11-16	3-4	2	13.00
14	4 Plain 428 to 601** 4 W. F. prior to 23** 5 Plain 428 to 581** 6 Plain 59 to 231**	7-8	2 3-4	1 1-2	3 1-4	23.50
22	2 and 2F Wire Feed; 2 Plain 1, 2 and 2G Auto.	5-8	1 3-4	1	2 3-4	16.00
*22C	2&2FW.F.; 2 Pl. 1, 2 & 2G Auto.	5-8	1 3-4	1	2 3-4	18.00
34	4 Plain; 4 Wire Feed	7-8	2 3-4	1 3-4	3	23.50
36	6 Plain; 6 Wire Feed	1 1-4	3	2	3 1-4	30.00

*Left-Hand. **Be sure to give serial number of machine.

Knee Tools

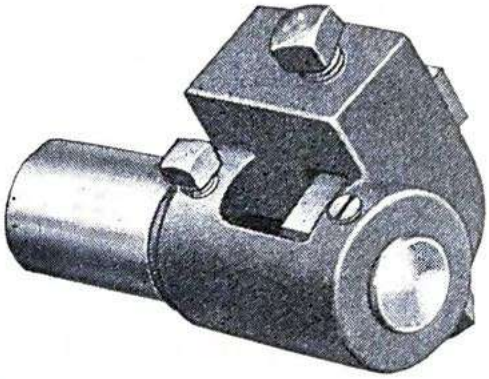
Knee Tools are used for simultaneous turning and internal cutting. The shank is arranged to hold a drill, counterbore or similar tool clamped by set screw. One tool blade is furnished.

No.	No. of Machine where used	Capacity		Diam. of Shank, Inches	Length of Shank, Inches	Length of Body, Inches	Price
		Length, Inches	Diameter, Inches				
00	00, 00G and 19 Auto.	1 1-4	3-8	5-8	1 1-8	1 3-8	$16.00
†00B							20.00
20	0 and 0G Automatic	2	15-32	3-4	1 1-2	2 1-4	19.50
†20B		1	13-16				24.00
22	2 and 2G Automatic	3	21-32	1	2	3	23.50
†22B		1 11-16	1 7-16				27.00
34	4 Pl. and 4 Wire Feed	8	1 3-16	1 3-4	3	4 7-8	53.00
		2 1-2	1 1-2				
36	6 Pl. and 6 Wire Feed	10	1 7-8	*	*	5	40.00
		4 5-8	2				

†Left-Hand. *Screwed to face of turret.

Pointing Tools

STYLE 1



Style 1 is provided with a bushing and Style 2 with a plain V rest which precedes the blade to support the work. The blade is adjustable.

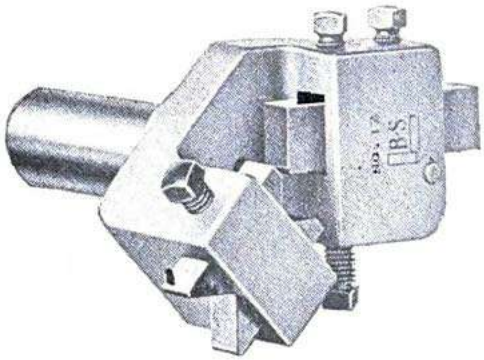
Style 1 is provided with one blade and blank bushing.

Nos. 00C, 20B, and 22B are arranged to hold a center drill or pointing tool in the shank, clamped in position by a set screw.

No.	No. of Machine where used	Capacity, Inches	Length of Body, Inches	Dist. Front of Bushing to Tool, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
00B	00, 00G, 19 Auto.	3-16	11-16	3-16	5-8	1 13-16	$9.75
00C	00, 00G, 19 Auto.	1-4	1 3-16	5-16	5-8	1 5-16	10.75
†00D	00, 00G, 19 Auto.	3-16	11-16	3-16	5-8	1 13-16	16.00
20B	0 and 0G Auto.	1-2	1 1-2	3-8	3-4	1 3-4	17.50
†20D	0 and 0G Auto.	1-2	1 1-2	3-8	3-4	1 3-4	20.00
22B	2 and 2G Auto.	7-8	1 7-8	1-2	1	2 1-2	23.50
†22D	2 and 2G Auto.	7-8	1 7-8	1-2	1	2 1-2	25.00

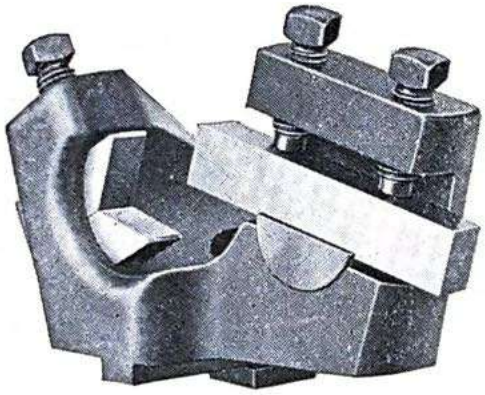
†Left-Hand.

STYLE 2



This style of Pointing Tool is provided with one blade and back rest.

No.	No. of Machine where used	Capacity, Inches	Length of Body, Inches	Dist. Front of Rest to Tool, Inches	Diam. of Shank, Inches	Length of Shank, Inches	Price
12	2 & 2 F W.F.; 2 Pl.	1-4 to 3-4	1 13-16	3-8	1	2 1-2	$23.50
34	4 Pl.; 4 W.F.	1-4 to 1 1-4	2 3-4	1-2	1 3-4	3	34.00
36	6 Pl.; 6 W.F.	1-2 to 1 1-2	2 15-16	5-8	2	3 1-4	43.00



Pointing Tools

These pointing tools are provided with one blade, and one V back rest preceding the tool.

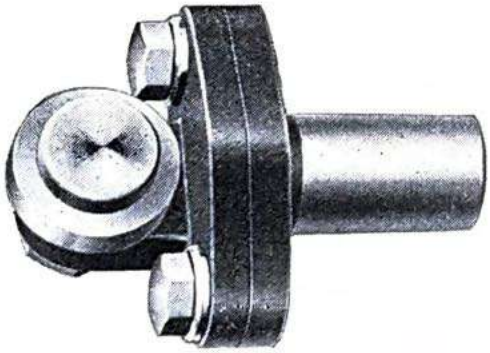
No.	No. of Machine where used	Points Work, Inches	From Back Rest to Tool Blade, Inches	Price
24	4 Automatic	To 1 1-2 diam.	9-16	$46.00
26	6 Automatic	To 1 1-2 diam.	9-16	49.00

Pointing Tool Holders

For Circular Tools

For use in the turret of Automatic Screw Machines for pointing or forming the end of the work. The circular tool may be readily removed and ground without changing its form.

The holder and shank are separate and, after the tool is adjusted central with the work, the two are clamped together. One tool blank is furnished with holder.

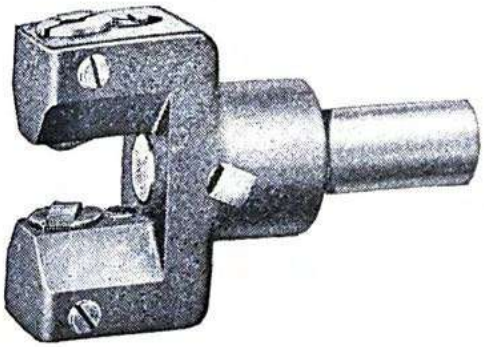


No.	No. of Machine where used	Length Body, Inches	Length Shank, Inches	Diameter Shank, Inches	Diameter Tool Bl'k, Inches	Price
00A	00, 00G and 19 Auto.	1 3-8	1 1-8	5-8	1 1-8	$16.00
20A	0 and 0G Auto.	1 9-16	1 11-16	3-4	1 3-8	19.50
22A	2 and 2G Auto.	1 15-16	1 3-4	1	1 3-4	27.00

Circular Pointing Tool Blanks

For use with the Holder shown above. Carbon Steel. Price of blanks for use on Nos. 00, 00G and 19 Automatic, **$0.55**; for use on Nos. 0 and 0G Automatic, **$0.55**; for use on Nos. 2 and 2G Automatic, **$0.75**.

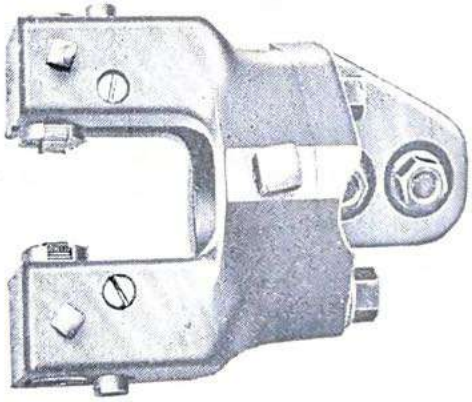
Adjustable Knurl Holders



The knurls are mounted in swiveling holders adjustable to any angle to produce straight, spiral, or diamond knurls, using ordinary straight knurling rolls. The knurl holders have screw adjustment for setting to any diameter of work within the capacity of the tool. The shank is arranged to take a bushing for holding end or internal cutting tools for operations to be combined with knurling. Pair of straight knurls furnished.

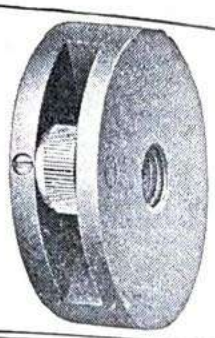
No.	No. of Machine where used	Size of Knurl, Inches	Diam. Shank, Inches	Length Shank, Inches	Diameter will Knurl, Inches	Length will Knurl, Inches	Length Body, Inches	Price
00	00, 00G & 19 Auto.	1/2 x 3/16 x 3/16	5-8	1 1-8	1-16 to 7-16	1	1 5-8	$23.50
20	0 & 0G Auto.	5/8 x 1/4 x 1/4	3-4	1 3-4	1-8 to 9-16	1 1-2	2 3-8	23.50
22	1, 2 & 2G Auto.	5/8 x 1/4 x 1/4	1	2 3-16	3-16 to 15-16 to 1 1-8	1 3-4 1-2	2 11-16	29.50
34	4 Pl. & 4 Wire Feed	3/4 x 1/4 x 1/4	1 3-4	3 1-4	3-8 to 1 7-16 to 1 1-2	3 5-8 2	5	80.00
36	6 Pl. & 6 Wire Feed	7/8 x 3/8 x 1/4	2	3 1-4	1-2 to 1 11-16 to 2	4 1-4 2 3-8	5 1-2	80.00

These adjustable knurl holders will produce either straight, spiral or diamond knurling, using ordinary straight knurling rolls. The knurls are mounted in holders which swivel to any angle, and are adjustable for diameter. Bushings listed, page 581.



No.	No. of Machine where used	Size of Knurl, Inches	Length will Knurl, Inches	Diam. of Hole in Body for Bushing, Inches	Price
24	4 Auto.	3/4 x 1/4 x 1/4	to 1 3-4 diam., 1 7-8 long or 1 5-8 diam., 3 1-2 long	1 3-4	$55.00
26	6 Auto.	7/8 x 3/8 x 1/4	to 2 diam., 2 1-4 long or 1 7-8 diam., 4 1-4 long	2	60.00

Side Knurl Holders for Cross Slide



Used on either front or back tool posts. Held in place in same manner as circular form tools and do not permit use of any other tool on the same post at the same time. Used for thread rolling on brass in addition to knurling. A straight knurl is furnished.

No.	No. of Machine where used	Size of Knurl, Inches	Diameter Holder, Inches	Width Holder, Inches	Width Knurl, Inches	Price
00A	00, 00G and 19	1/2 x 3/16 x 3/16	1 3-4	9-16	3-16	$6.25
20A	-0 and 0G	5/8 x 1/4 x 1/4	2 1-4	5-8	1-4	8.00
22A	2 and 2G	3/4 x 1/4 x 1/4	3	11-16	1-4	9.75

Top Knurl Holders for Cross Slide

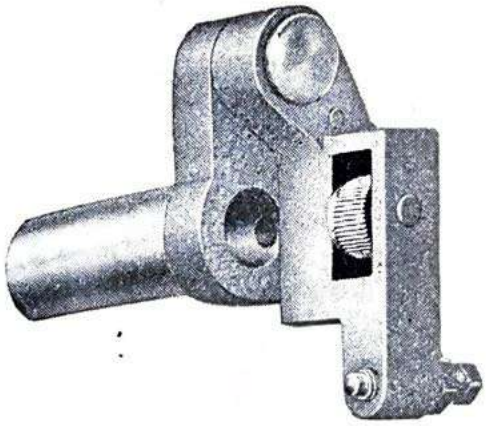
Used on back tool post, knurl passing over work. They are held on a hub on circular tool between tool and post, both circular tool and knurl holder being clamped by one bolt. They are also used for thread rolling on brass, in which case the cutting-off tool is mounted on the same tool post. A straight knurl is furnished.

No.	No. of Machine where used	Size of Knurl, Inches	Capacity, Inches	Width Knurl, Inches	Price
00B	00, 00G and 19 Auto.	1/2 x 3/16 x 3/16	3-8	3-16	$13.75
20B	0 and 0G Auto.	5/8 x 1/4 x 1/4	5-8	1-4	16.00
22B	2 and 2G Auto.	3/4 x 1/4 x 1/4	1 1-8	1-4	19.00

Bottom Knurl Holder for Cross Slide

Used on the back tool post, on machines with swing stop, the knurl passing under work. It is held on a hub on circular tool between tool and post, both circular tool and knurl holder being clamped by one bolt. It is also used for thread rolling on brass, in which case cutting-off tool is mounted on same tool post. A straight knurl is furnished.

No.	No. of Machine where used	Size of Knurl, Inches	Capacity, Inches	Width Knurl, Inches	Price
00C	00, 00G and 19 Auto.	1/2 x 3/16 x 3/16	3-8	3-16	$18.00



Knurling Swing Tools

The Swing Knurl Holder is carried in the turret and is operated by either a Fixed or Adjustable Guide held under the front cross slide post. It carries a single knurl and is used for knurling behind shoulders of large diameter or where knurled section is at some distance from the end of the piece. A straight knurl is furnished.

Price does not include either Fixed or Adjustable Guide.

No.	No. of Machine where used	Size of Knurl, Inches	Capacity, Inches	Diam. Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00K	00, 00G & 19 Au.	1/2x3/16x3/16	1 1-4 long up to 3-8 dia. 5-8 long up to 7-16 dia.	5-8	1 5-8	1 1-4	$34.00
20K	0 & 0G Auto.	5/8x1/4x1/4	2 long up to 15-32 dia. 7-8 long up to 13-16 dia.	3-4	2	1 3-4	35.50
22K	2 & 2G Auto.	3/4x1/4x1/4	3 long up to 21-32 dia. 1 1-4 long up to 1 3-8 dia.	1	2 1-2	2 3-16	42.50

Straight Knurls for Screw Machine Tools

For use with the Turret and Cross Slide Knurling Holders listed on pages 591, 592 and 593. These knurls produce straight or diamond knurling, depending upon the angle at which they are mounted. Used with Adjustable Knurl Holders on page 591 they can produce spiral knurling. The teeth are cut to an included angle of 90 degrees. Knurls are made of tool steel and hardened. When ordering, specify diameter, width of face, size of hole, and number of teeth.

Outside Diameter, Inches	Width of Face, Inches	Diameter of Hole, Inches	No. of Teeth in Knurl	Approx. No. of Teeth per Inch	Knurl Holder where used	Price
1-2	3-16	3-16	84 73 65 55	53 47 41 35	00, 00A, 00B	$1.00
5-8	1-4	1-4	92 81 68 56 47 37	47 41 35 29 24 19	20, 20A, 20B, 22	1.10
3-4	1-4	1-4	97 82 68 57 45	41 35 29 24 19	21A, 21B, 22A 22B, 24, 34	1.20
7-8	3-8	1-4	113 96 80 66 52	41 35 29 24 19	26, 36	1.40

Blanks of the above sizes are carried in stock from which diamond, spiral and straight cut knurls with any number of teeth can be made to order.

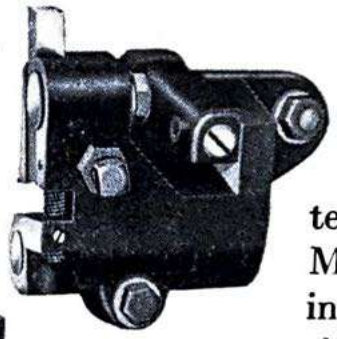
Swing Tools

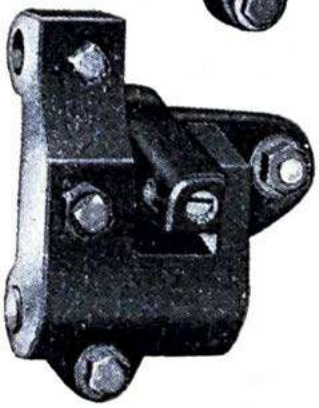
The Swing Tool is operated by either an Adjustable or Fixed Guide held under the front tool post. It is used for straight, taper or irregular turning where box tools or circular form tools are not applicable. It is also used for cutting off when both cross slide tools are used for forming. The shank is arranged to hold a back rest for supporting work. A tool blade is furnished.

No.	No. of Machine where used	Capacity, Inches	Diam. Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00C *00L	00, 00G, 19	1 1-4 long up to 3-8 dia.	5-8	1 5-8	1 1-16	$34.00 38.00
20C	0 and 0G	2 long up to 15-32 dia. or 7-8 long up to 5-8 dia.	3-4	2	1 1-2	35.50
20B *20L	0 and 0G	2 long up to 15-32 dia. or 1 1-8 long up to 5-8 dia.	3-4	2	1 3-4	35.50 40.00
22C	2 and 2G	3 long up to 21-32 dia. or 1 1-8 long up to 1 dia.	1	2	1 7-8	38.50
22B *22L	2 and 2G	3 long up to 21-32 dia. or 1 3-4 long up to 1 dia.	1	2	2 17-32	42.50 44.00

*Left-Hand.

Price does not include Fixed or Adjustable Guide.



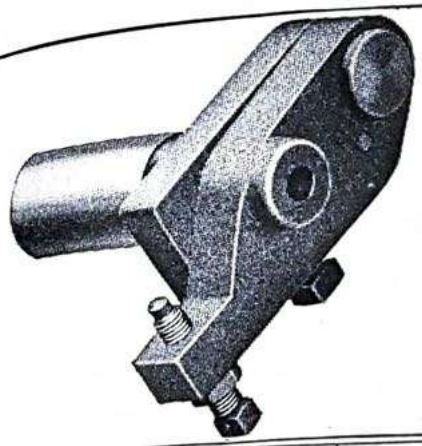


Swing Tools

Swing Tool shown in upper cut is for external work on Nos. 4 and 6 Automatic Screw Machines, and Recessing Swing Tool shown in lower cut is for internal work on same machines.

Fixed or Adjustable Guides are not included.

No.	No. of Machine where used	Swings from Center, Inches	Price
24A 24R	4 Automatic	7-8 21-32	$56.00 48.00
26A 26R	6 Automatic	1 1-16 5-8	58.00 50.00



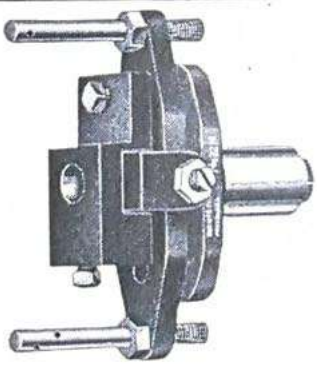
Recessing Swing Tools

The Recessing Swing Tool is operated in the same manner as the Swing Tool. It is used for chamfering and recessing internally.

Price does not include Fixed or Adjustable Guide.

No.	No. of Machine where used	Swing from Center, Inches	Diameter Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00H	00, 00G, 19	3-16	5-8	1 3-8	15-16	$35.50
20H	0 and 0G	1-4	3-4	1 3-4	1 1-4	38.50
22H	2 and 2G	9-32	1	2	2 1-4	42.50

Recessing Tools



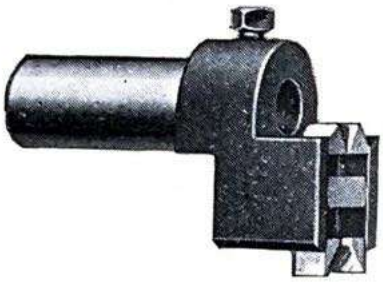
This Recessing Tool is used for chamfering and recessing internally and is operated by the forward movement of the turret. When adjustable studs come in contact with chuck guard over nose of spindle, tool starts cutting.

No.	No. of Machine where used	Diameter Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00M	00, 00G, 19 Auto.	5-8	1	1 1-4	$36.00
20M	0 and 0G Auto.	3-4	1 1-2	1 1-2	42.00
22M	2 and 2G Auto.	1	1 5-8	2	48.00

Back Rests for Swing Tools

Inserted in the hole in the shank of swing tool holders and held in place by a set screw.

No.	No. of Machine where used	Capacity, Inches	Diameter Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00	00, 00G, 19	1-4	7-16	1 7-16	3-4	$9.75
20	0 and 0G	5-16	1-2	1 11-16	1	13.75
22	2 and 2G	1-2	11-16	2 1-4	1 7-16	17.75



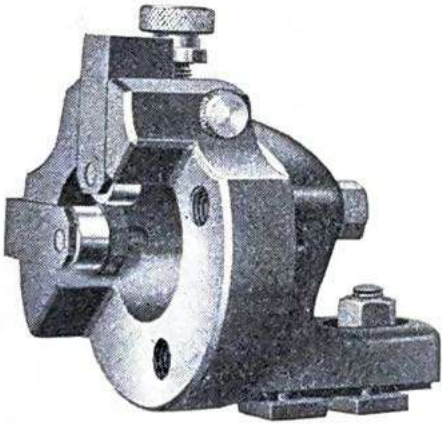
Back Rests for Turret

Clamped in any of the turret holes. A set screw is provided in the shank for holding a stock stop or end cutting tool in the shank.

No.	No. of Machine where used	Capacity, Inches	Diam. Shank, Inches	Length Shank, Inches	Length Body, Inches	Price
00	00, 00G & 19 Auto.	3-8	5-8	1 3-4	13-16	$8.75
00A	00, 00G & 19 Auto.	3-8	5-8	1 1-8	1 1-2	9.75
20	0 & 0G Auto.	5-8	3-4	1 3-4	1 5-8	14.00
22	1, 2, and 2G Auto.	1 1-8	1	2 3-8	1 3-4	19.00

Back Rests for Turret

These Back Rests are of the roller type and are used for steadying the stock, to prevent springing, under cross slide operations.



No.	No. of Machine where used	Used on Work Diameter, Inches	Price
24	4 Automatic	5-16 to 1 1-4	$70.00
26	6 Automatic	3-8 to 1 1-2	75.00

Back Rests for Chuck

No. 00 Back Rest is used only on the Nos. 00, 00G, and 19 Automatic Screw Machines. It clamps over the outside of the chuck guard and carries a floating head in which a bushing is clamped. Used between collet and tools or between cutting-off and forming tools for supporting small sizes of stock. Greatest distance between collet and back rest, 1 inch. **Price:** No. 00 Back Rest with one blank bushing, **$50.00.**

Fixed Guides

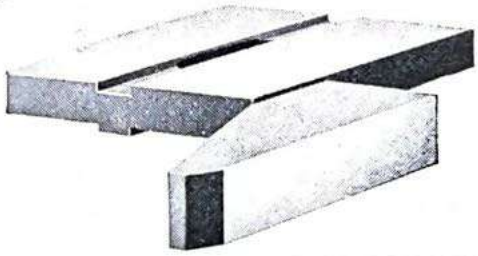
Regular

Regular styles held under front tool post in place of raising block. Left-hand styles fasten to sides of tool posts. Used for guiding motion of arm of swing tool for forming, recessing, knurling or thread rolling.

Left-Hand

No.	No. of Machine where used	Length Guide, Inches	Price
00A	00, 00G and 19 Auto.	1 3-8	$8.00
*00C	00, 00G and 19 Auto.	1 3-8	8.00
20A	0 and 0G	1 3-4	9.75
*20C	0 and 0G	1 3-4	9.75
22A	2 and 2G	2	13.75
*22C	2 and 2G	2	13.75

*Left-Hand.

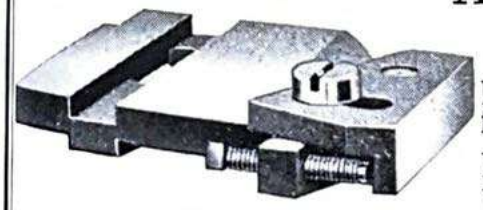


Fixed Guides

Held under front tool post in place of raising block. Used for guiding motion of arm of swing tool for forming, recessing, knurling or thread rolling.

No.	No. of Machine where used	Length of Guide, Inches	Price
24A	4 Automatic	5 7-8	$29.00
26A	6 Automatic	6 1-2	29.00

Adjustable Guides



Regular

Held under front tool post. Left-hand styles fasten to sides of tool posts. Used in connection with swing and taper turning tools. The arm carrying the guide can be adjusted in and out. The guide has an angular adjustment with the line of the spindle.

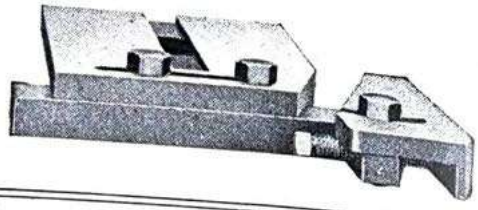
Left-Hand

No.	No. of Machine where used	Length of Guide, Inches	Guide Swings Through Angle	Price
00	00, 00G and 19	1 5-8	30° incl.	$9.75
*00B	00, 00G and 19	1 5-8	30° incl.	12.00
20	0 and 0G	2 1-4	30° incl.	12.00
*20B	0 and 0G	2 1-4	18° incl.	15.00
22	2 and 2G	3 1-8	30° incl.	16.00
*22B	2 and 2G	3 1-8	30° incl.	18.00

*For Left-Hand Swing Tools.

Adjustable Guides

For taper turning with swing tools. They have adjustment of guide toward or from line of spindle and swing of guide through an included angle of 30 degrees.



No.	No. of Machine where used	Length of Guide, Inches	Price
24	4 Automatic	5	$39.00
26	6 Automatic	6 3-8	39.00

Stock Stops for Turrets

The stops are finished tapered on one end and are hardened.

	Price
For Nos. 00 and 00G Auto. Screw Mach.	$0.55
For Nos. 0 and 0G Auto. Screw Mach.	.55
For No. 1 Auto. Screw Mach.	.65
For Nos. 2 and 2G Auto. Screw Mach.	.65

Spindle Brakes

The Brake consists of a wide, circular metal band lined with leather, and drawn together on the open side by a clamping screw. Means are provided for attaching to the machine frame.

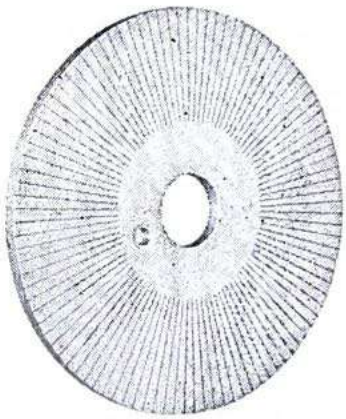
It is used for stopping the spindle and holding it rigidly while cross drilling, milling, etc. It is applied to one of the spindle pulleys in place of the belt, except on the No. 2G, where it clamps over one of the sprocket wheels with a shoe engaging the sprocket wheel teeth.

No.	No. of Machine where used	Width, Inches	Outside Diameter, Inches	Inside Diameter, Inches	Price
00	00 & 00G Auto.	1 1-4	4 7-16	4	$27.50
00A	00 & 00G H.S. Auto.	1 1-4	3 1-2	3 1-16	27.50
20	0 & 0G Auto.	2	6 7-16	6	30.00
20A	0 & 0G H.S. Auto.	1 3-4	5 7-16	5	30.00
22	2 Auto.	2 1-2	7 1-2	7	35.00
22A	2 & 2G H.S. Auto.	2	6 7-8	6 1-4	35.00
22G	2G Auto.	1 3-16	4 7-8	4 11-32	45.00

Cam Blanks

Made of mild steel and, except those for the Nos. 4 and 6 machines, are bored, turned and graduated into 100 parts to assist in laying out the cam. Cam Blanks for Nos. 4 and 6 machines are provided with necessary holes, but are left square and are not graduated.

No. of Auto. Screw Mach. where used	Diam. Center Hole, Inches	Diam. Cross Slide, Inches	Price, Each	Diam. Lead, Inches	Price, Each	Price per Set, 2 Cross Slide and 1 Lead Cams
00, 00G and 19	1	4 1-2	$1.00	4 1-2	$1.00	$3.00
				5	1.00	3.00
				6	1.30	3.90
0 and 0G	1 1-8	6	1.30	6 1-2	1.30	3.90
				7	1.30	3.90
				7	1.70	5.10
1, 2 and 2G	1 1-4	7	1.70	8	1.70	5.10
				9	2.00	5.40
No. 4	1 5-8	8	3.00	12	6.00	12.00
No. 6	1 7-8	9	4.00	15	10.00	18.00



Adjustable Cam Holders

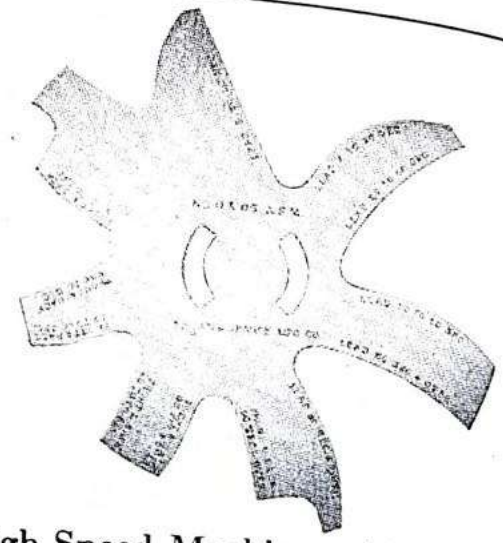
By using these Holders on cross slide camshaft, positions of front and back cross slide cams can be changed readily in relation to one another or to lead cam. Each holder consists of cam driving disk and cam holder. Cams can be moved, and their positions changed as desired, without being taken off of machine. In some cases these holders make possible the use of one set of cams on a number of similar jobs simply by varying their relative positions. Graduations on driving disk permit same settings to be obtained for repetition of similar work.

In ordering, specify whether holders are for front or back cross slide cams.

No.	No. of Machine where used	Price, Holder for Front Cross Slide Cam	Price, Holder for Back Cross Slide Cam
00	00 Auto.	$15.00	$12.00
20	0 Auto.	15.00	12.00
22	2 Auto.	15.00	12.00

In ordering, specify whether holders are for front or back cross slide cams.

Cam Templates



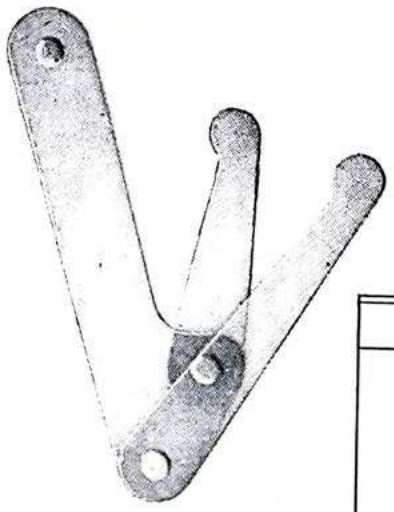
Cam Templates are used for laying out the rise and drop on the cam lobes for various speeds. The one shown is used with the No. 0 and 0G Automatic Screw Machines. The templates for the other sizes of machines differ slightly in appearance but cover the same requirements.

They are made of nickel silver or celluloid as preferred except those for High Speed Machines which are regularly furnished of celluloid only. Specify which style desired when ordering.

No.	Auto. Scr. Machine where used, No.	Seconds to Make One Piece	Price
00	00, 00G & 19	3 to 91	$5.50
00 HS	00 & 00G HS	3-4 to 45 1-2	5.50*
20	0 & 0G	5 to 353	6.75
20 HS	0 & 0G HS	1 2-3 to 176	6.75*
22	2 & 2G	6 to 480	8.00
22 HS	2 & 2G HS	3 to 240	8.00*
24A	4, Cross Slide Cam	12 to 800	12.00
24B	4, Lead Cam		18.50
26A	6, Cross Slide Cam	13 1-3 to 800	13.00
26B	6, Lead Cam		24.00

*Celluloid only. Price of Templates of Nickel Silver on application.

Lever Templates



Lever Templates are used for laying out cams in cases where very close timing is required, as, for instance, when a tool is operated by the combined action of the cross slide and turret slide. They are made from sheet celluloid.

No.	Auto. Scr. Machine where used, No.	Price
00	00, 00G & 19	$6.75
20	0 & 0G	6.75
22	2 & 2G	8.00
24	4	12.00
26	6	13.00

Miscellaneous Equipment and Tables

B·S

Ground Flat Stock
Vises
Mandrels and Expansion Bushings
Index Plates
Work Driving Dogs
Hangers
Friction Pulleys
Bench Centers
Cutter Testing Fixture
Surface Plates
Straight Edges
Pumps
Textile Reels and Scales
Hair Clippers
Gear Service
Publications
Tables

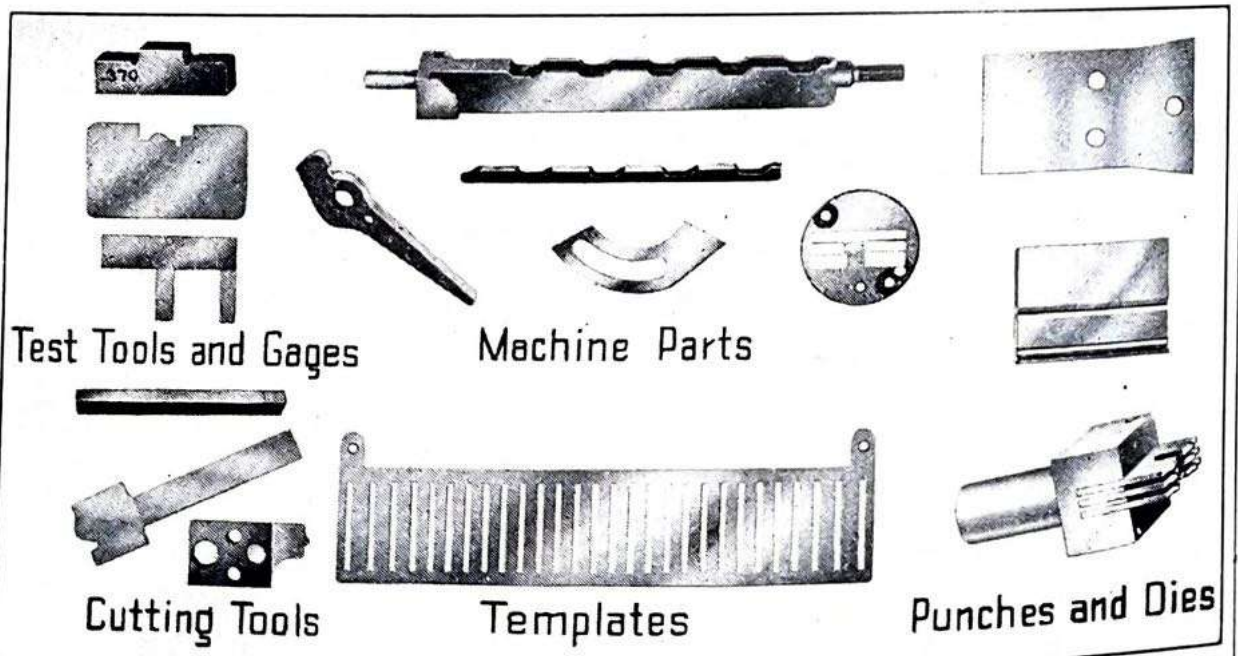
Ground Flat Stock

Brown & Sharpe Ground Flat Stock saves time and money when high grade tool steel, in thicknesses from 1/64″ to 1/2″, or larger in square sizes, is needed for templates, dies, gages, machine parts, or other purposes. Accurately ground to .001″ on special equipment, it saves users slow and costly flat grinding operations which frequently cause distortion and overheating.

Brown & Sharpe Ground Flat Stock is specially selected, first quality tool steel with carbon per cent 1.20—1.30, annealed so that it may be readily machined. It will harden the same as any first quality tool steel.

Sizes carried in stock are listed with their prices on the opposite page. Each piece is marked with its size and with the Brown & Sharpe name. Special sizes and thicknesses can be furnished at reasonable prices.

A Few Parts Made from Ground Flat Stock



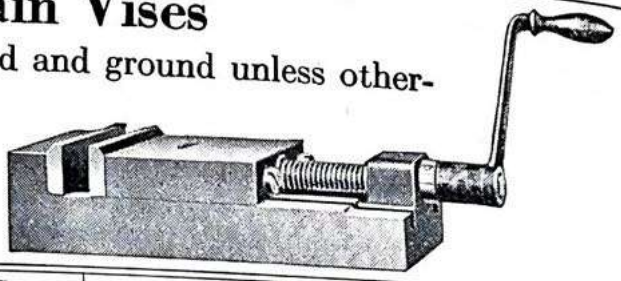
Ground Flat Stock—Sizes and Prices

Size, Inches	Price, Per Piece
1-64	
1 x 18 x 1-64	$0.85
1 1-2x 18 x 1-64	1.05
2 x 18 x 1-64	1.25
2 1-2x 18 x 1-64	1.55
3 x 18 x 1-64	1.85
4 x 18 x 1-64	2.50
1-32	
3-4x 18 x 1-32	.60
1 x 18 x 1-32	.60
1 1-2x 18 x 1-32	.80
2 x 18 x 1-32	1.00
2 1-2x 18 x 1-32	1.25
3 x 18 x 1-32	1.50
3 1-2x 18 x 1-32	1.75
4 x 18 x 1-32	2.00
5 x 18 x 1-32	3.00
6 x 18 x 1-32	4.00
3-64	
1 x 18 x 3-64	.55
1 1-2x 18 x 3-64	.75
2 x 18 x 3-64	.95
2 1-2x 18 x 3-64	1.15
3 x 18 x 3-64	1.40
4 x 18 x 3-64	1.90
5 x 18 x 3-64	2.75
6 x 18 x 3-64	3.75
1-16	
1-2x 18 x 1-16	.40
3-4x 18 x 1-16	.45
1 x 18 x 1-16	.50
1 1-4x 18 x 1-16	.65
1 1-2x 18 x 1-16	.70
2 x 18 x 1-16	.90
2 1-2x 18 x 1-16	1.10
3 x 18 x 1-16	1.35
3 1-2x 18 x 1-16	1.60
4 x 18 x 1-16	1.85
5 x 18 x 1-16	2.50
6 x 18 x 1-16	3.50
3-32	
1-2x 18 x 3-32	.55
3-4x 18 x 3-32	.65
1 x 18 x 3-32	.70
1 1-2x 18 x 3-32	.85
3-32	
2 x 18 x 3-32	$1.00
2 1-2x 18 x 3-32	1.20
3 x 18 x 3-32	1.40
3 1-2x 18 x 3-32	1.65
4 x 18 x 3-32	1.90
5 x 18 x 3-32	2.75
6 x 18 x 3-32	3.75
1-8	
1-2x 18 x 1-8	.60
3-4x 18 x 1-8	.70
1 x 18 x 1-8	.75
1 1-4x 18 x 1-8	.85
1 1-2x 18 x 1-8	.90
2 x 18 x 1-8	1.05
2 1-2x 18 x 1-8	1.30
3 x 18 x 1-8	1.50
3 1-2x 18 x 1-8	1.75
4 x 18 x 1-8	2.00
5 x 18 x 1-8	2.85
6 x 18 x 1-8	4.00
5-32	
3-4x 18 x 5-32	.75
1 x 18 x 5-32	.85
1 1-2x 18 x 5-32	1.10
2 x 18 x 5-32	1.40
2 1-2x 18 x 5-32	1.60
3 x 18 x 5-32	1.80
4 x 18 x 5-32	2.30
3-16	
1-2x 18 x 3-16	.75
3-4x 18 x 3-16	.90
1 x 18 x 3-16	.95
1 1-4x 18 x 3-16	1.15
1 1-2x 18 x 3-16	1.20
2 x 18 x 3-16	1.50
2 1-2x 18 x 3-16	1.70
3 x 18 x 3-16	2.00
3 1-2x 18 x 3-16	2.30
4 x 18 x 3-16	2.60
5 x 18 x 3-16	3.50
6 x 18 x 3-16	4.50
7-32	
1 x 18 x 7-32	1.05
1 1-2x 18 x 7-32	1.35
2 x 18 x 7-32	1.60
7-32	
2 1-2x 18 x 7-32	$1.90
3 x 18 x 7-32	2.20
4 x 18 x 7-32	3.00
1-4	
1-4x 18 x 1-4	1.00
1-2x 18 x 1-4	.95
1 x 18 x 1-4	1.15
1 1-2x 18 x 1-4	1.45
2 x 18 x 1-4	1.80
2 1-2x 18 x 1-4	2.20
3 x 18 x 1-4	2.60
3 1-2x 18 x 1-4	3.05
4 x 18 x 1-4	3.50
5 x 18 x 1-4	4.50
6 x 18 x 1-4	5.50
5-16	
5-16x 18 x 5-16	1.25
1-2x 18 x 5-16	1.20
1 x 18 x 5-16	1.50
1 1-2x 18 x 5-16	1.80
2 x 18 x 5-16	2.15
2 1-2x 18 x 5-16	2.60
3 x 18 x 5-16	3.05
4 x 18 x 5-16	4.00
3-8	
3-8x 18 x 3-8	1.50
1-2x 18 x 3-8	1.50
3-4x 18 x 3-8	1.65
1 x 18 x 3-8	1.75
1 1-2x 18 x 3-8	2.05
2 x 18 x 3-8	2.40
2 1-2x 18 x 3-8	2.95
3 x 18 x 3-8	3.50
4 x 18 x 3-8	4.50
1-2	
1-2x 18 x 1-2	1.75
3-4x 18 x 1-2	2.15
1 x 18 x 1-2	2.65
2 x 18 x 1-2	3.30
3 x 18 x 1-2	4.40
4 x 18 x 1-2	5.40
3-4	
3-4x 18 x 3-4	2.50
1	
1 x 18 x 1	3.25

Other sizes furnished to order. Prices upon application.

Plain Vises

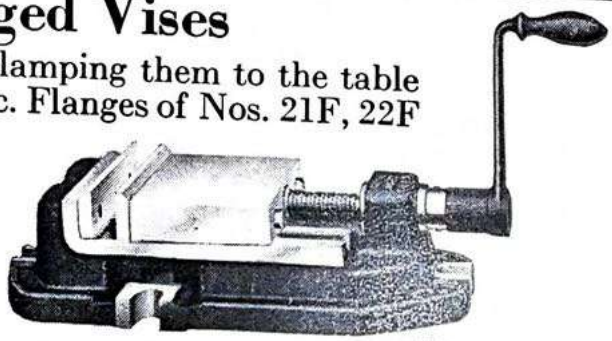
Jaws are tool steel, hardened and ground unless otherwise specified and interchangeable. No. 4P differs from cut; movable jaw is attached from jaw side.



No.	Width of Jaws, Inches	Depth of Jaws, Inches	Jaws Open, Inches	Shipping Weight, Lbs.	Price
1P	4 1-8	1 1-16	2	17	$24.00
2P	5 1-8	1 1-4	2 3-4	27	29.00
3P	6 1-8	1 9-16	3 5-8	50	34.00
4P	7 1-8	2	4 1-2	90	51.00

Flanged Vises

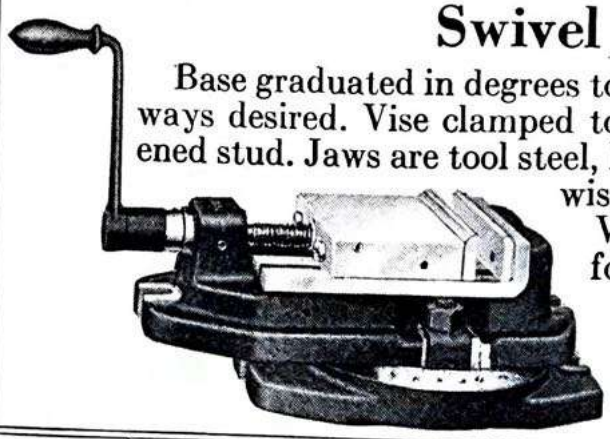
These vises have flanges for clamping them to the table of Milling Machines, Planers, etc. Flanges of Nos. 21F, 22F and 23F return coolant into table channels. Jaws are tool steel, hardened and ground, unless otherwise specified and interchangeable. Furnished with bolts, nuts, and washers.



No.	Width of Jaws, Inches	Depth of Jaws, Inches	Jaws Open, Inches	Shipping Weight, Lbs.	Price
21F	4 1-8	1 1-16	2	26	$25.00
22F	5 1-8	1 1-4	2 3-4	42	34.00
23F	6 1-8	1 9-16	3 5-8	62	43.00
14F	7 1-8	2	4 1-2	120	63.00
15F	8 5-8	2 1-2	7	210	89.00

Swivel Vises

Base graduated in degrees to allow setting vise at angle to table ways desired. Vise clamped to base by T bolt; centers on hardened stud. Jaws are tool steel, hardened and ground, unless otherwise specified and interchangeable. Vises have reversible tongues for either 11/16″ or 13/16″ slots; used on table with corresponding T slots. Bolts, nuts and washers furnished. Vises can be furnished with tongues for 5/8″ or 3/4″ slots.

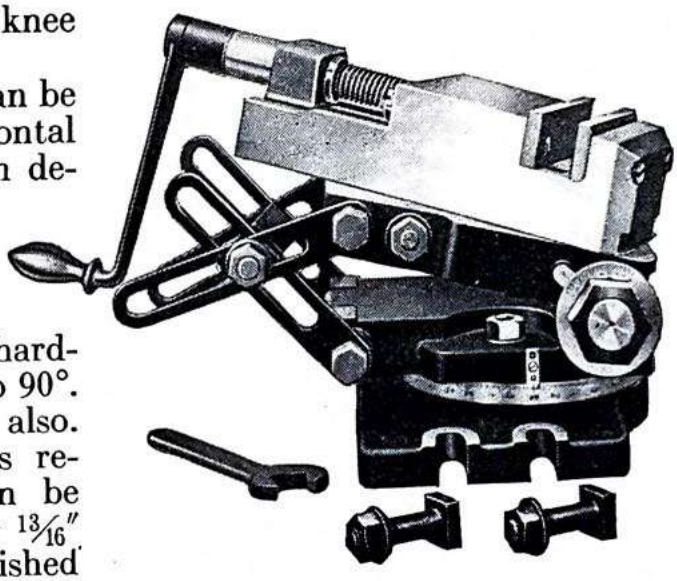


No.	Width of Jaws, Inches	Depth of Jaws, Inches	Jaws Open, Inches	Height, Inches	Shipping Weight, Lbs.	Price
22S	5 1-8	1 1-4	2 3-4	4 7-8	62	$45.00
23S	6 1-8	1 9-16	3 5-8	5 5-16	106	55.00
14S	7 1-8	2	4 1-2	7 1-8	182	77.00

Brown & Sharpe Vises

Body and slide are one piece semi-steel castings proportioned to absorb stresses uniformly. Nut is high grade bronze and removable. Most styles have full width bearing on vise body; work does not tend to pivot or shift vertically even when cutting at extreme end of jaws, a desirable feature.

Toolmakers' Universal Vises



Consists of a hinged knee which swivels on base.

Lower part of the knee can be set at any angle in a horizontal plane. Base is graduated in degrees. Upper part can be set at any angle to 90° in a vertical plane and clamped rigidly in position. The hinge bolt has a hardened steel dial graduated to 90°.

The vise proper swivels also.

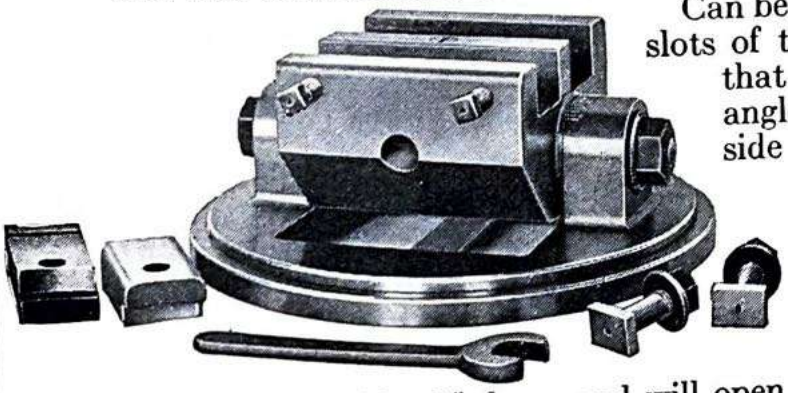
Lower part of base has reversible tongue which can be used with either 11/16″ or 13/16″ slots. Vises can be furnished with tongues for 5/8″ or 3/4″ slots.

The jaws are of tool steel, hardened and ground, unless otherwise specified and interchangeable. Each vise is furnished with wrench, bolts, nuts and washers.

No.	Width of Jaws, Inches	Depth of Jaws, Inches	Jaws Open, Inches	Net Weight, Lbs.	Shipping Weight, Lbs.	Price
2T	5 1-8	1 1-4	2 3-4	65	80	$95.00
3T	6 1-8	1 9-16	3 5-8	135	160	120.00

Adjustable Swivel Vise

For use on Planers, Surface Grinding Machines, etc.



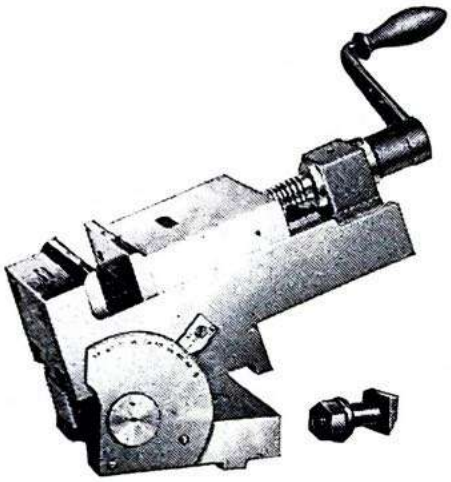
Can be set at any angle with T slots of table and is pivoted so that it can be set at any angle to 40 degrees either side of the horizontal, the angle being indicated by a graduated arc. Bolts, nuts, washers and clamps are furnished. Height of vise, 4″.

The jaws are 5″ wide, 1″ deep, and will open 2 3/4″. **Price, $45.00.**

Weight: Net, about 30 lbs.; shipping, about 40 lbs.

A graduated base plate can be supplied, when required. Price on application.

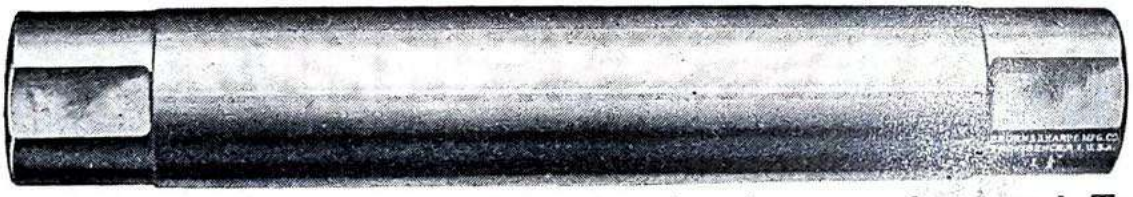
No. 1 Adjustable Vise



For grinding machines and lighter classes of work. Fastened directly to the table by means of a single bolt and is located by a tongue that fits in the T slot of the table. Tongue is reversible for ½″ or 9/16″ T slots and is parallel to jaws.

Can be set at any angle from 0 to 90° in a vertical plane. Dial, graduated in degrees, indicates the setting. Jaws are tool steel, hardened and ground unless otherwise specified and interchangeable. Jaws are 4⅛″ wide, 1 1/16″ deep, and open 2″. Distance from the bottom of the base to the top of the jaws, 4½″. Bolt, nut and washer are furnished. Weights: Net, 23 lbs.; Shipping, 27 lbs. **Price, $60.00.**

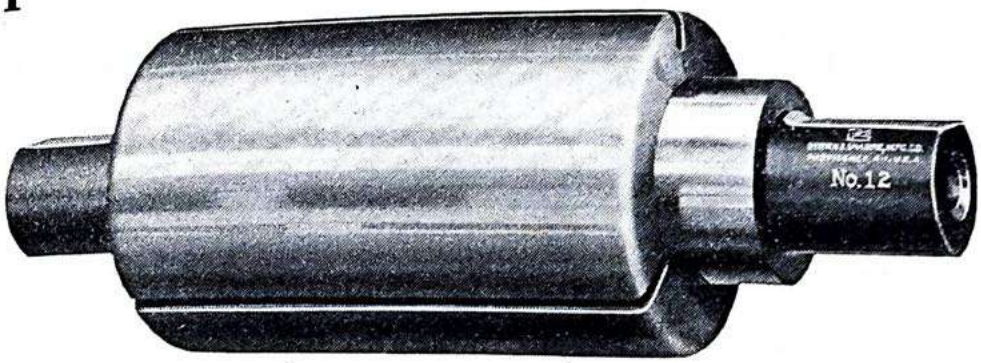
Lathe Mandrels



These Mandrels are tool steel, hardened and accurately ground. Tapered .0005″ to one inch. Mandrels from 3/16″ to 1″ are .0005″ under size at small end; those from 1 1/16″ to 3″, .001″ under size at small end.

Diameter, Inches	Total Length, Inches	Price	Diameter, Inches	Total Length, Inches	Price	Diameter, Inches	Total Length, Inches	Price
3-16	3	$1.20	1	7	$2.80	1 13-16	10 1-4	$8.00
1-4	3 3-4	1.20	1 1-16	7 1-4	3.40	1 7-8	10 1-2	8.00
5-16	4	1.30	1 1-8	7 1-2	3.40	1 15-16	10 3-4	9.00
3-8	4 1-4	1.40	1 3-16	7 3-4	4.00	2	11	9.00
7-16	4 1-2	1.50	1 1-4	8	4.00	2 1-8	11 1-2	10.00
1-2	5	1.60	1 5-16	8 1-4	4.80	2 1-4	12	11.00
9-16	5 1-4	1.80	1 3-8	8 1-2	4.80	2 3-8	12	12.00
5-8	5 1-2	1.80	1 7-16	8 3-4	5.60	2 1-2	12 1-2	13.00
11-16	5 3-4	2.00	1 1-2	9	5.60	2 5-8	12 1-2	14.50
3-4	6	2.00	1 9-16	9 1-4	6.40	2 3-4	13	16.00
13-16	6 1-4	2.40	1 5-8	9 1-2	6.40	2 7-8	13	17.50
7-8	6 1-2	2.40	1 11-16	9 3-4	7.20	3	13	19.00
15-16	6 3-4	2.80	1 3-4	10	7.20			

Taper Mandrels and Expansion Bushings



Taper Mandrels

Mandrel No.	Whole Length, Inches	Diam. at Small End, Inches	Price	Mandrel No.	Whole Length, Inches	Diam. at Small End, Inches	Price
3	3 11-16	.3125	$2.55	9	7 3-16	.90	$4.70
4	4 1-16	.35	2.70	10	7 3-4	1.05	5.50
5	4 1-2	.45	3.00	11	8 3-8	1.25	6.40
6	5 1-8	.50	3.30	12	9	1.50	7.30
7	5 15-16	.60	3.60	13	9 5-8	1.75	8.60
8	6 9-16	.75	4.15	..	...	....	....

Mandrels take Bushings as follows: No. 3, 2 sizes; Nos. 4, 5, 6, 7 and 8, 3 sizes; Nos. 9, 10, 11, 12 and 13, 6 sizes.

Expansion Bushings

These Bushings are cast iron. They are intended to fit standardized holes, and are capable of expanding .005 to .007 of an inch.

Outside Diameter of Bushing, Inches	Length, Inches	For Mandrel No.	Price	Outside Diameter of Bushing, Inches	Length, Inches	For Mandrel No.	Price
1-2	1 1-2	3	$1.00	2	4	10	$3.70
9-16	1 5-8	3	1.00	2 1-16	4 1-8	10	3.70
5-8	1 3-4	4	1.20	2 1-8	4 1-8	10	3.70
11-16	1 7-8	4	1.20	2 3-16	4 1-4	10	3.70
3-4	2	4	1.20	2 1-4	4 1-4	10	3.70
13-16	2 1-8	5	1.50	2 5-16	4 3-8	11	4.35
7-8	2 1-4	5	1.50	2 3-8	4 3-8	11	4.35
15-16	2 3-8	5	1.50	2 7-16	4 1-2	11	4.35
1	2 1-2	6	1.75	2 1-2	4 1-2	11	4.35
1 1-16	2 5-8	6	1.75	2 9-16	4 5-8	11	4.35
1 1-8	2 3-4	6	1.75	2 5-8	4 5-8	11	4.35
1 3-16	2 7-8	7	2.10	2 11-16	4 3-4	12	5.10
1 1-4	3	7	2.10	2 3-4	4 3-4	12	5.10
1 5-16	3 1-8	7	2.10	2 13-16	4 7-8	12	5.10
1 3-8	3 1-4	8	2.55	2 7-8	4 7-8	12	5.10
1 7-16	3 3-8	8	2.55	2 15-16	5	12	5.10
1 1-2	3 1-2	8	2.55	3	5	12	5.10
1 9-16	3 5-8	9	3.15	3 1-16	5 1-8	13	5.80
1 5-8	3 5-8	9	3.15	3 1-8	5 1-8	13	5.80
1 11-16	3 3-4	9	3.15	3 3-16	5 1-4	13	5.80
1 3-4	3 3-4	9	3.15	3 1-4	5 1-4	13	5.80
1 13-16	3 7-8	9	3.15	3 5-16	5 3-8	13	5.80
1 7-8	3 7-8	9	3.15	3 3-8	5 3-8	13	5.80
1 15-16	4	10	3.70	....	....	....	....

Work Arbors

For Automatic Gear Cutting Machines

Mark	No. of Machine where used	No. of Taper of Shank	Length of Bushing, Inches	No. of Taper for Bushing	Smallest Possible Bush., In.	Price
*I	3 and 13	10	3	6	3-4	$16.00
J	3 and 13	12	3 1-2	9	1 1-4	25.50
K	3 and 13	12	3 1-2	11	1 3-4	25.50
*M	3H, 4 and 13H	11	3 1-2	7	1	20.00
†N	3H and 4	14	5	10	1 1-2	28.00
†O	3H and 4	14	5	12	2	28.00
P	13H	14	5	10	1 1-2	26.50
*Q	5	12	4 1-2	10	1 1-2	25.50
†R	5	16	6	13	2 1-2	45.00
†S	5	16	6	14	3 1-4	45.00
T	13H	14	5	12	2	30.00
†*U	6	14	6	12	2 1-4	50.00
†V	6	18	7 1-2	14	3	55.00
†W	6	18	9	18	4	60.00

*Has tang end for use in collets listed on page 551.

†These arbors differ from one shown in cut in having a teat or straight end extending beyond nut and fitting into the bushing of outer support furnished with the Nos. 3H, 4, 5 and 6 machines.

Arbors J, K, N, O, P and T have ¾″, V Thd., 12 R. H. threaded hole in end for draw-in bolt.

Arbors R and S have ⅞″, V Thd., 10 R. H. threaded hole in end for draw-in bolt.

Arbors V and W have 1″, V Thd., 10 R. H. threaded hole in end for draw-in bolt.

Expansion Bushings for Work Arbors

For Automatic Gear Cutting Machines

Outside Diam., Inches	No. of Machine where used	Length, Inches	No. Taper Hole	Used with Arbor	Price
3-4	3 and 13	3	6	E and I	$2.00
7-8	3 and 13	3	6	E and I	2.00
1	3 and 13	3	6	E and I	2.00
1 1-8	3 and 13	3	6	E and I	2.00
1 1-4	3 and 13	3 1-2	9	F and J	2.55
1 3-8	3 and 13	3 1-2	9	F and J	3.00
1 1-2	3 and 13	3 1-2	9	F and J	3.00
1 5-8	3 and 13	3 1-2	9	F and J	3.75

In ordering, state outside diameter and letter of Arbor.

List continued on next page.

Expansion Bushings for Work Arbors

For Automatic Gear Cutting Machines (*Continued*)

Outside Diameter, Inches	No. of Machine where used	Length, Inches	No. Taper Hole	Used with Arbor	Price
1 3-4	3 and 13	3 1-2	11	K	$3.75
2	3 and 13	3 1-2	11	K	4.35
2 1-4	3 and 13	3 1-2	11	K	4.35
1	3H, 4 and 13H	3 1-2	7	M	2.00
1 1-8	3H, 4 and 13H	3 1-2	7	M	2.00
1 1-4	3H, 4 and 13H	3 1-2	7	M	2.55
1 3-8	3H, 4 and 13H	3 1-2	7	M	3.00
1 1-2	3H, 4 and 13H	5	10	N and P	3.00
1 5-8	3H, 4 and 13H	5	10	N and P	3.75
1 3-4	3H, 4 and 13H	5	10	N and P	3.75
2	3H, 4 and 13H	5	10	N and P	4.35
2	3H, 4 and 13H	5	12	O and T	4.35
2 1-4	3H, 4 and 13H	5	12	O and T	4.35
2 1-2	3H, 4 and 13H	5	12	O and T	5.25
2 3-4	3H, 4 and 13H	5	12	O and T	6.15
3	3H, 4 and 13H	5	12	O and T	6.90
1 1-2	5	4 1-2	10	Q	3.00
1 5-8	5	4 1-2	10	Q	3.75
1 3-4	5	4 1-2	10	Q	3.75
2	5	4 1-2	10	Q	4.35
2 1-4	5	4 1-2	10	Q	4.35
*2 1-2	5	6	13	R	5.25
*2 3-4	5	6	13	R	6.15
†*3	5	6	13	R	6.90
*3 1-4	5	6	13	R	6.90
3 1-4	5	6	14	S	6.90
*3 1-2	5	6	13	R	7.20
3 1-2	5	6	14	S	7.20
2 1-4	6	6	12	U	4.35
2 1-2	6	6	12	U	5.25
2 3-4	6	6	12	U	6.15
*3	6	7 1-2	14	V	7.30
*3 1-4	6	7 1-2	14	V	6.75
*3 1-2	6	7 1-2	14	V	7.15
*3 3-4	6	7 1-2	14	V	8.25
†*4	6	7 1-2	14	V	8.50
4	6	9	18	W	8.90
4 1-2	6	9	18	W	9.90
5	6	9	18	W	10.90

In ordering, state outside diameter and letter of Arbor.
Bushings marked * can be used on Withdrawing Work Arbors furnished.
Bushings marked † are furnished with the machine.

Angular Index Plates

Patented

For Indexing in Degrees and Minutes

The holes in the outer and inner circles differ one minute in angular positions, permitting indexing in degrees and minutes. Inner circle has 18 holes. Outer circle contains 30 numbered holes.

Indexing can be done in either direction by using front or back of plate. A bushing slightly thicker than plate is furnished so that plate can be rotated freely.

The 18 hole circle, most used in standard indexing, can be used for dividing 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 40, 45, 48 and others beyond, a convenient feature.

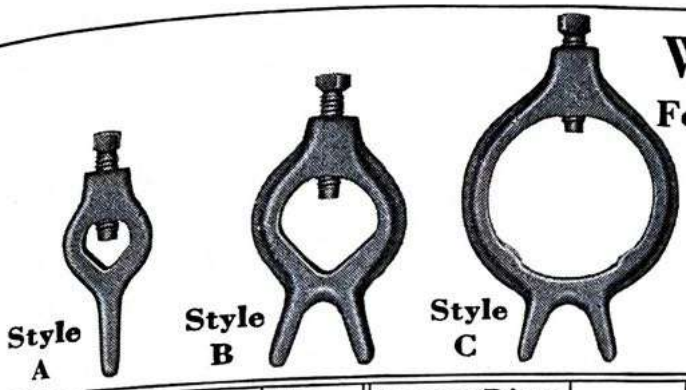
No.	Brown & Sharpe Index Centers where used	Price
10	*10″ Universal and Universal Spiral	$14.00
12	*12″ Universal and Universal Spiral	15.00

*Special Back Pin Arrangement is required for use with 10″ and 12″ Universal Index Centers. In ordering, specify size of Index Centers.

Price For Trunion Type $13.00
For Quadrant Type ..... On Application

Index Plates

No.	Brown & Sharpe Index Centers where used	Plate Diam., Inches	Center Hole, Inches	Number of Holes in Each Circle	Price
1	6″ Univ., 10″ Univ.	4 3-4	1 1-8	15 16 17 18 19 20	$5.00
2	10″ Univ. Spiral and	4 3-4	1 1-8	21 23 27 29 31 33	5.00
3	10″ and 12″ Plain	4 3-4	1 1-8	37 39 41 43 47 49	5.00
7	6″ Univ., 10″ Univ.,	5	1 1-8	15 16 17 18 19 20	5.00
8	10″ Univ. Spiral, and	5	1 1-8	21 23 27 29 31 33	5.00
9	10″ and 12″ Plain	5	1 1-8	37 39 41 43 47 49	5.00
13	12″ Univ., 12″ Univ.	6 1-4	1 1-2	15 16 17 18 19 20	6.75
14	Spiral, No. 4 Triple	6 1-4	1 1-2	21 23 27 29 31 33	6.75
15	and No. 14 Triple	6 1-4	1 1-2	37 39 41 43 47 49	6.75
28	14″ Univ., 15″ Univ.	7 1-2	1 3-4	15 16 17 18 19 20	6.75
29	and 14″ Univ.	7 1-2	1 3-4	21 23 27 29 31 33	6.75
30	Spiral	7 1-2	1 3-4	37 39 41 43 47 49	6.75

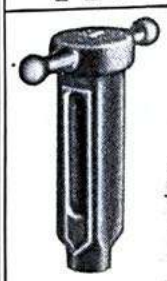


Work Driving Dogs

For Use on Grinding Machines

Malleable iron with smooth japan finish. Hardened steel clamp screws.

Largest Diam. Work, Inches	Style	Price, Each	Largest Diam. Work, Inches	Style	Price, Each	Largest Diam. Work, Inches	Style	Price, Each
1-4	A	$0.55	1 1-4	C	$0.55	2 1-2	C	$0.70
3-8	A	.55	1 3-8	C	.55	2 3-4	C	.70
1-2	A	.55	1 1-2	C	.55	3	C	.70
5-8	B	.55	1 5-8	C	.55	3 1-4	C	.70
3-4	B	.55	1 3-4	C	.55	3 1-2	C	.70
7-8	B	.55	1 7-8	C	.55	3 3-4	C	.70
1	C	.55	2	C	.70	4	C	.70
1 1-8	C	.55	2 1-4	C	.70			

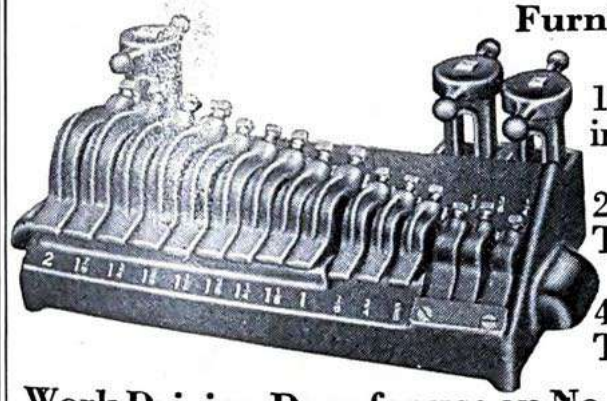


Socket Wrenches

Socket Wrenches are of malleable iron, case hardened.

Socket Wrench
- for Dogs 1/4″ to 7/8″ inclusive..... **Price, Each $0.75**
- for Dogs 1″ to 1 1/2″ inclusive..... **Price, Each .75**
- for Dogs 1 5/8″ to 2″ inclusive..... **Price, Each .90**
- for Dogs 2 1/4″ to 4″ inclusive..... **Price, Each .90**

Furnished also in sets in cast iron trays.



Set of Work Driving Dogs 1/4″ to 1 1/2″ incl. with 2 Socket Wrenches in Tray..... **Price, $9.00**

Set of Work Driving Dogs 1/4″ to 2″ incl. with 3 Socket Wrenches in Tray..... **Price, $12.00**

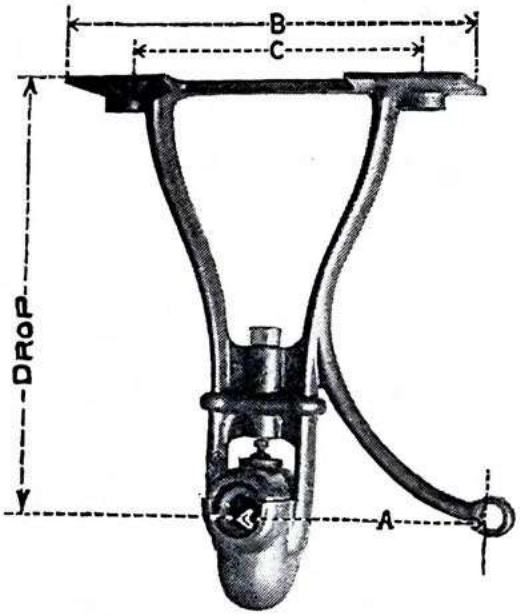
Set of Work Driving Dogs 1/4″ to 4″ incl. with 4 Socket Wrenches in Tray..... **Price, $15.00**

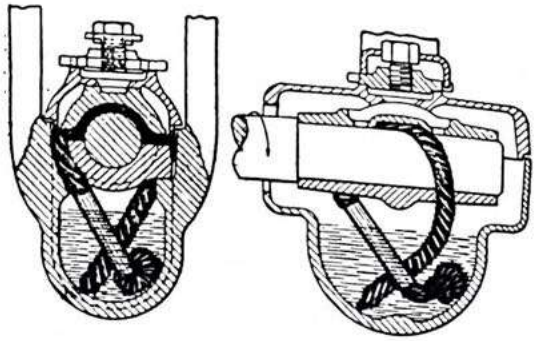
Work Driving Dogs for use on No. 30 Series Plain Grinding Machines

Largest Diam. Work, Inches	Style	Price, Each	Largest Diam. Work, Inches	Style	Price, Each	Largest Diam. Work, Inches	Style	Price, Each
5-8	A	$0.70	1 7-8	A	$0.70	3 1-8	A	$0.85
7-8	A	.70	2 1-8	A	.85	3 3-8	A	.85
1 1-8	A	.70	2 3-8	A	.85	3 5-8	A	.85
1 3-8	A	.70	2 5-8	A	.85	4	A	.85
1 5-8	A	.70	2 7-8	A	.85			

These dogs are also furnished in sets.
Set of Work Driving Dogs 5/8″ to 4″ inclusive..... **Price, $11.00**

Self-Oiling Hangers





These hangers are entirely self-oiling, a large supply of oil being carried in the reservoir and fed to the bearings through a wick by capillary attraction. They can be furnished with or without arms and with one end of the drip closed or both ends open.

Two shipper rod stops and one shipper dog are furnished with each pair of hangers with arms. When hangers and friction pulleys are ordered together, a shipper fork is sent. The feet on all sizes of hangers are 4½″ wide.

No. 1
Takes Boxes 1″ x 4″ or 1 1-4″ x 4 1-2″

Drop, Inches	Distance from Center of Shaft to Shipper Rod A, Inches	Extreme Width B, Inches	Distance Between Centers of Bolt Holes C, Inches	Diameter of Holes, Inches	Net Weight, Lbs.	Single Hanger, Price
10	No arm	16	12 1-8	3-4	12	$4.75
10	7 9-16	16	12 1-8	3-4	14	5.00
10	8 5-16	16	12 1-8	3-4	14 1-2	5.00
12	No arm	16	12 1-8	3-4	12	4.75
12	7 9-16	16	12 1-8	3-4	14 1-2	5.00
12	8 5-16	16	12 1-8	3-4	14	5.00
12	9 7-16	16	12 1-8	3-4	15	5.00
12	10 9-16	16	12 1-8	3-4	15	5.00
16	No arm	16	12 1-8	3-4	14	5.00
16	7 9-16	16	12 1-8	3-4	16 1-2	5.25
16	8 5-16	16	12 1-8	3-4	20	5.25
16	9 7-16	16	12 1-8	3-4	20	5.25
17	No arm	16	12 1-8	3-4	15	5.00
18	No arm	16	12 1-8	3-4	15	5.00

Self-Oiling Hangers

No. 2

Takes Boxes 1 1-2″ x 6″ or 1 11-16″ x 6 1-2″

Drop, Inches	Distance from Center of Shaft to Shipper Rod A, Inches	Extreme Width B, Inches	Distance Between Centers of Bolt Holes C, Inches	Diameter of Holes, Inches	Net Weight, Lbs.	Single Hangers, Price
12	No arm	16	12 1-8	7-8	16	$7.00
12	9 7-16	16	12 1-8	7-8	18 1-2	7.25
12	11 5-16	16	12 1-8	7-8	18 1-2	7.25
12	9 7-16 and 11 7-16	16	12 1-8	7-8	21	7.25
12	11 5-16 and 13 1-16	16	12 1-8	7-8	21	7.25
16	No arm	16	12 1-8	7-8	20	7.25
16	9 7-16	16	12 1-8	7-8	23	7.50
16	11 1-16	16	12 1-8	7-8	25	7.50
16	11 1-16 and 13 1-16	16	12 1-8	7-8	26	7.50

No. 3

Takes Boxes 1 11-16″ x 6 1-2″, 1 15-16″ x 7″ or 2 3-16″ x 7 1-2″

12	10 13-16	19	15	1 1-8	36	$14.50
12	10 13-16 and 12 13-16	19	15	1 1-8	38	14.50
14	12 13-16	19	15	1 1-8	43	15.00
14	12 13-16 and 14 13-16	19	15	1 1-8	44	15.00

*No. 5

Takes Boxes 2″ x 8″, 2 3-16″ x 9″ or 2 7-16″ x 10″

16	No arm	22	18	1 1-8	53 1-2	$21.00
16	12 9-16	22	18	1 1-8	57	21.50
16	12 9-16 and 14 9-16	22	18	1 1-8	58	21.50

*Differs slightly from one shown in cut on opposite page.

Countershafts

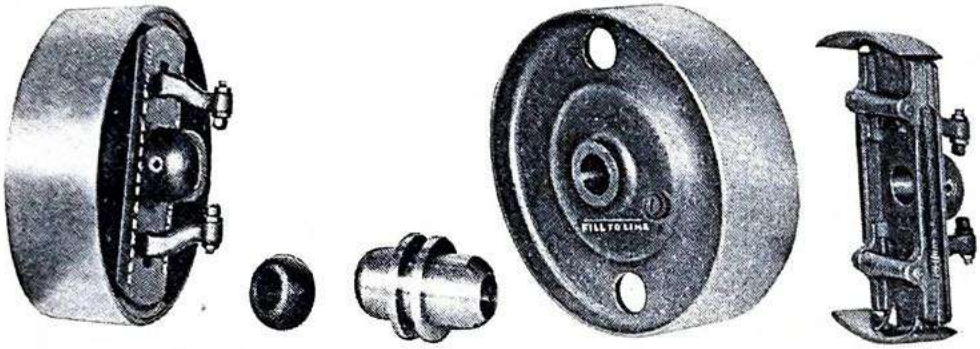
With Friction Pulleys, Hangers and Boxes

Price includes shaft, one pair of Pad Type Self-Oiling Friction Pulleys, one pair Self-Oiling Hangers, shipper rod, forks, stops and stud for attaching shipper handle.

With Friction Pulleys, Diameter, Inches	Length of Shaft in Clear Between Hangers, Inches	Diameter of Shaft, Inches	Diameter of Bearing, Inches	Net Weight, Lbs.	Price
8	26	1 1-4	1	114	$35.00
10	33	1 1-4	1	136	44.00
12	33	1 1-2	1 1-4	169	52.00
14	33	1 1-2	1 1-4	185	59.00
16	44	1 11-16	1 1-2	254	75.00
18	44	1 11-16	1 1-2	286	89.00

Self-Oiling Friction Pulleys

Pad Type



The pad type friction pulleys are simple in construction and noiseless when in use. Friction is applied when the thimble is pushed between the set screws in the ends of the two operating levers. The levers spread and bring the two friction pads in contact with the inside rim of the pulley. Each pulley contains a center oil pocket which lubricates the bearing when the pulley is running idle. All the parts are easily adjusted to compensate for wear.

Each pair of pulleys has one thimble and two collars. Each single pulley has one thimble and one collar.

When ordering two or more pulleys, state if same are to be used singly or in pairs.

Diameter, Inches	Belt, Inches	Hole, Inches	Net Weight, Lbs.	Price, Each	Price, Per Pair
8	2 1-4	1 1-4	16	$11.00	**$20.00**
10	3	1 1-4	24	15.00	**28.00**
12	3 1-2	1 1-2	36	19.00	**36.00**
14	3 1-2	1 1-2 or 1 11-16	44	23.00	**44.00**
16	4	1 11-16	62	28.00	**54.00**
18	4 1-2	1 11-16	79	35.00	**68.00**

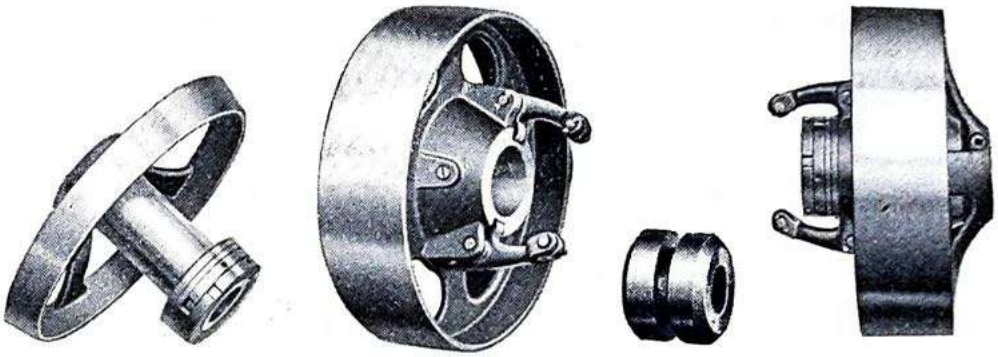
The space required to operate Friction Pulleys and the maximum speeds at which these pulleys can be run satisfactorily, are given in the table below:

Diameter of Pulley, Inches	Single Pulley, Inches	Two Pulleys, Inches	Three Pulleys, Inches	Max. Speed, Revolutions Per Minute
8	10	16 1-4	...	450
10	12 3-8	20	...	375
12	14	23	42 5-8	325
14	14	23 1-4	43 1-8	275
16	15	25	...	250
18	15 1-2	26	...	225

Pulleys with special holes furnished when desired. **Prices on Application.**

Self-Oiling Friction Pulleys

Cone Type



The Cone Type pulley is designed for high speed and hard service. The pulley runs on the hub of the inner friction surface and is provided with a self-oiling bronze bushing, that amply lubricates the bearing when the pulley is running idle.

When the thimble is pushed between the hardened rolls in the ends of the levers, the levers spread and draw the friction surface of the pulley in contact with the friction cone. A thimble is furnished with each pulley or pair of pulleys. When ordering two or more pulleys state whether they are to be used singly or in pairs.

Diameter, Inches	Belt, Inches	Size of Hole, Inches	Weight, Lbs.	Single Pulley, Price	Price, Per Pair
8	2 1-2	1 1-4 or 1 1-2	23	**$20.00**	**$38.00**
10	3	1 1-2 or 1 11-16	37	**24.00**	**46.00**
12	3 1-2	1 1-2, 1 11-16 or 1 15-16	59	**30.00**	**58.00**
14	4	1 11-16 or 1 15-16	74	**38.00**	**74.00**
16	4 1-2	1 11-16, 1 15-16 or 2 3-16	93	**55.00**	**108.00**

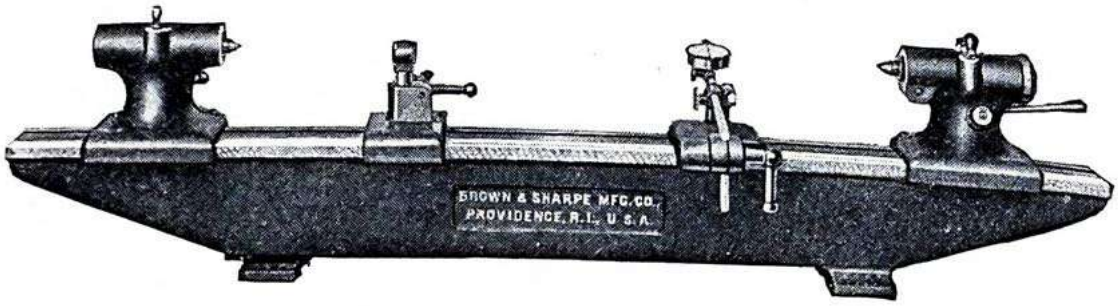
The space required to operate Friction Pulleys is given in the table below:

Diameter, Inches	Single Pulley, Inches	Two Pulleys, Inches	Three Pulleys, Inches
8	11 1-8	19	36 1-8
10	11 1-8	19 1-4	36 1-2
12	12 3-4	22 1-2	41
14	14 1-4	24 3-4	46 1-2
16	16 1-2	28 3-4	53 3-4

Pulleys with special holes furnished when desired. **Prices on Application.**

It is often desirable for a machine to have three pulleys operated by one shipper rod so as to give different speeds in the same direction. For this purpose we furnish pulleys (at the regular price) with special long levers and thimbles on sizes 12″ and 14″ of the Pad Type and on sizes 8″, 10″, 12″, 14″ and 16″ of the Cone Type.

Bench Centers



Price, With Dial Test Indicator, $140.00; Without Dial Test Indicator, $112.00.

These centers swing 8″ in diameter and take work 36″ in length.

The head and foot-stock spindles are of steel, ground and accurately fitted. The foot-stock center is held firmly in contact with the work by a stiff spring and as the spindle is quickly operated by a lever, work can be easily placed in position and removed. Provision is made for clamping the foot-stock spindle when desired.

The bench centers are furnished with or without Dial Test Indicators which can be furnished to read in either English or Metric Measure. For complete description of Dial Test Indicator see Dial Test Indicator No. 730, on page 410.

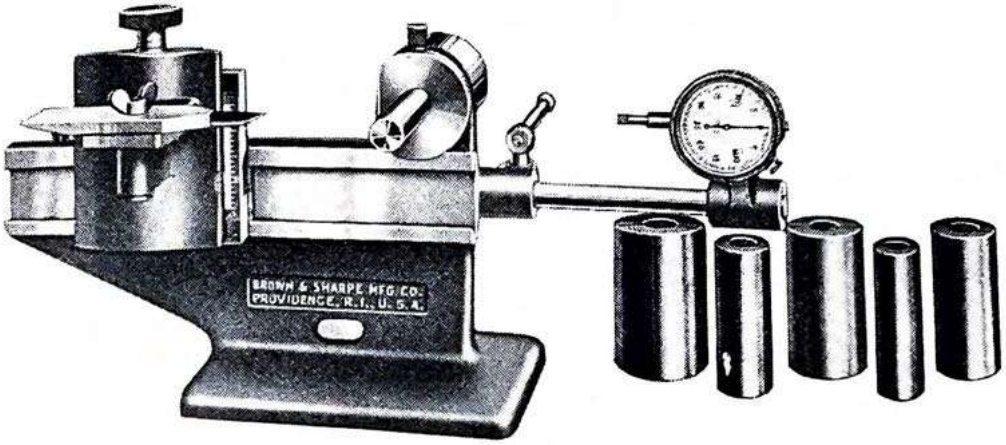
The sleeve that holds the dial gage arm can be clamped at any height on the post or turned around to bring the arm on either side. The arm turns in the sleeve and may be set at any angle relative to the base. All parts are detachable.

A work support is furnished.

All the parts are movable on the bed and are clamped in position by screws provided with fixed handles thus dispensing with wrenches.

Weight, Net, about 150 lbs.; weight for shipment, about 215 lbs. Dimensions for shipment, 55″ x 12″ x 14″. Space occupied about 5 cubic feet.

Cutter Testing Fixture



Price, $125.00 **Without Dial Gage, $110.00**

This Cutter Testing Fixture is used conveniently when sharpening gear or other formed cutters or hobs. Cutters of all sizes up to 10″ in diameter can be accommodated.

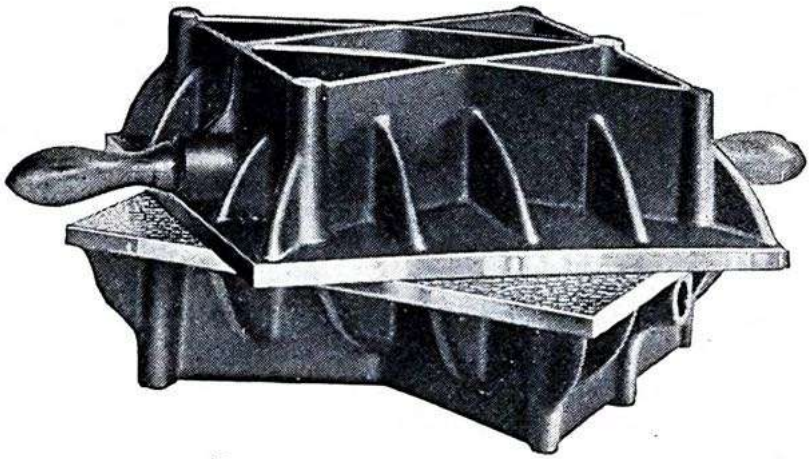
The testing plate is carried on a vertical slide which makes possible the testing of cutters whose cutting faces are either radial or undercut. The position of the testing plate is indicated accurately by means of a scale graduated in 50ths of an inch. One end of the test plate is flat for testing straight gashed cutters and hobs, and the other end is made in the form of a knife-edge to permit the testing of spiral formed cutters or hobs having spiral gashes.

The stud upon which the cutters are supported is made of hardened steel, 5/8″ diameter. It has a taper shank which fits into a taper steel sleeve that is fastened securely in the fixture body.

The dial gage reads to half-thousandths of an inch **English Measure** or hundredths of a millimeter **Metric Measure.** For complete description of dial gage, see Dial Gages No. 726 on page 406.

Equipment: Five bushings, hardened and ground, 7/8″, 1″, 1 1/4″, 1 1/2″ and 1 3/4″ diameter, and a collar for use when testing thin cutters.

Cast Iron Surface Plates

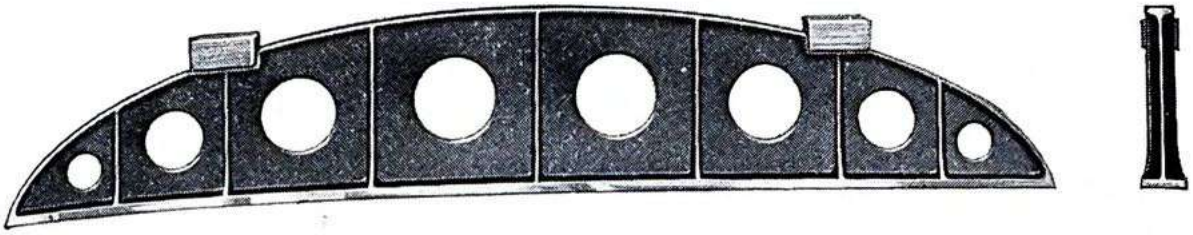


These plates are usually sold singly, not in pairs as shown in cut. Prices quoted are for single plate with cover.

Size, Inches	Approximate Weight, Lbs.	Price, Including Cover	Size, Inches	Approximate Weight, Lbs.	Price, Including Cover
3 1-2 x 4	3	$8.00	12 x 18	60	$45.00
3 1-2 x 12	10	15.00	12 x 24	116	62.50
4 x 7	7	10.00	12 x 36	185	90.00
4 x 15	18	18.00	*12 x 144	2000	510.00
4 x 18	19	20.00	*12 x 65	390	180.00
*4 x 40	80	37.50	14 x 14	56	38.50
4 1-2 x 6	6	10.00	14 x 18	68	50.00
5 x 16	18	20.00	14 x 21	90	62.50
6 x 6	7 1-2	12.00	15 x 30	177	95.00
6 x 12	17	20.00	16 x 16	70	50.00
6 x 26	47	33.00	16 x 48	355	174.00
6 x 50	110	65.00	*16 x 60	600	225.00
*6 x 72	280	108.00	18 x 18	100	65.00
6 1-2 x 18	30	26.50	18 x 24	143	88.00
7 x 7 1-2	10	15.00	18 x 36	255	115.00
7 x 10	15	20.00	20 x 30	225	126.00
8 x 12	20	23.00	*20 x 78	800	340.00
*8 x 42	90	65.00	24 x 24	210	119.00
9 x 9	18	18.50	24 x 36	340	182.00
9 x 14	30	24.50	24 x 48	525	245.00
*9 x 24	55	43.00	24 x 60	810	317.00
*9 1-2 x 48	150	90.00	30 x 36	460	228.00
10 x 15	40	30.00	30 x 60	930	394.00
10 x 30	115	63.50	36 x 68	1550	557.00
10 x 50	217	105.00	*42 x 42	900	390.00
*11 x 84	800	240.00	....	....	....
12 x 12	40	28.50	....	....	....

*Made to order only.

Cast Iron Straight Edges



These Straight Edges are of a form best adapted to retain a straight line.

The edge of each is scraped to form a true surface, and the straight edges when thus made are indispensable in the proper scraping of the ways of planer and lathe beds, etc.

Size, Inches	Weight, Lbs.	Price, Including Cover
18 x 1 1-2	5	**$24.00**
24 x 1 5-8	10	**27.00**
30 x 1 3-4	13	**30.00**
36 x 1 7-8	17	**34.00**
48 x 2	34	**40.00**
60 x 2 1-8	54	**52.00**
72 x 2 1-4	75	**64.00**
84 x 2 5-16	110	**78.00**
96 x 2 3-8	150	**94.00**
120 x 2 3-4	295	**120.00**
*144 x 3	420	.....
*180 x 3 1-2	835	.....

*Made to order only. **Prices upon Application.**

Cast Iron Packing Boxes

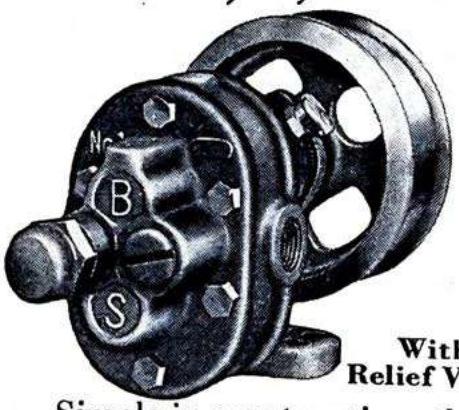
For Use in Case Hardening and Annealing Furnaces

Available in wide range of sizes. Economical and convenient where volume of work is such that an investment in alloy boxes is not warranted.

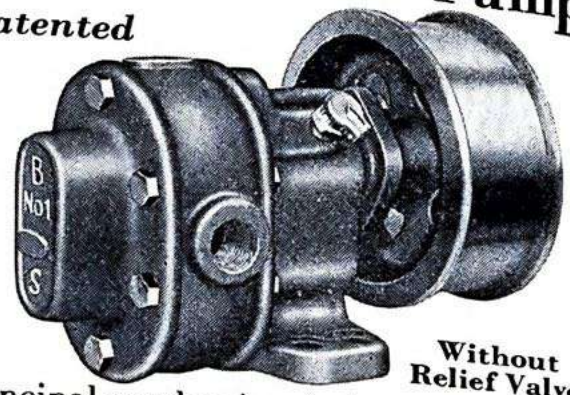
Prices upon Application.

Nos. 1, 2, 3 and 4 Rotary Geared Pumps

Patented



With Relief Valve



Without Relief Valve

Simple in construction, the principal mechanism being a pair of gears which runs together in a tight case.

Can be furnished when required with relief valve which acts as emergency safety valve. Relief valves are adjustable for pressures from 15 to 75 pounds (55 pounds on No. 1); they are set at factory to release at 30 pounds (approx.).

Pumps run in either direction. Discharge is on side of pump toward which top of pulley rotates and relief valve must be placed on discharge side.

These pumps will raise oil on suction side a distance of 25 to 35 feet with tight piping and at speeds above 600 r.p.m. To avoid necessity of priming, pump should be placed as near as possible to level of liquid being pumped.

In pumping water, grease cups applied to pump bearings, lengthen life of pump. Furnished with grease cups at slight additional cost. See page 630.

Furnished without relief valve and with pulley unless otherwise ordered.

Pump No.	R.P.M.	Capacity Gals. per Min. at 0 Lbs. Pressure	Suction and Discharge Pipe Connection, Inches	*Pulley Diam., Inches	Belt Width, Inches	Keyway, Inches	Net Weight, with Pulley, Lbs.
1	300–900	1 1-2 to 4 1-2	3-8	3 7-16	1	1-8 x 5-8	7
2	300–900	3 to 9	1-2	4 1-4	1	3-16 x 3-4	12
3	300–900	5 1-2 to 16 1-2	3-4	5	1 1-4	3-16 x 1	22 1-2
4	300–900	8 1-2 to 26	1 1-4	5	1 1-4	3-16 x 1	27

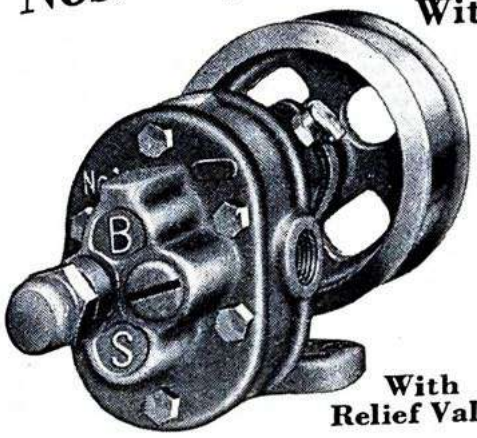
Pump No.	Without Pulley Without Relief Valve	Without Pulley With Relief Valve	With Pulley Without Relief Valve	With Pulley With Relief Valve
1	$10.00	$11.00	$11.00	$12.00
2	12.00	13.50	13.50	15.00
3	14.00	15.75	16.00	17.75
4	28.00	†	30.00	†

†Upon application.
*Larger pulleys for pressure work, furnished at extra cost.

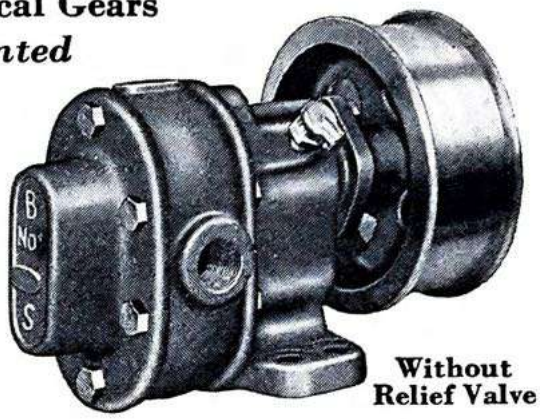
Nos. 1S, 2S and 3S Rotary Geared Pumps

With Helical Gears

Patented



With Relief Valve



Without Relief Valve

The helical gears run smoothly and quietly and permit higher speeds than pumps with spur gears. The renewable bronze bearings with which these pumps are equipped is a desirable feature.

Because of the closely fitted gears, pumps are for use only with comparatively clean liquids. They are particularly suited for pumping clean oil, oil emulsion, soda solution, etc.

Pumps run in either direction; discharge is on side of pump toward which top of pulley rotates.

Pumps will raise oil on suction side a distance of 25 to 35 ft. with tight piping at speeds above 1,000 R.P.M. To avoid necessity of priming, pump should be placed as near as possible to level of liquid being pumped.

In pumping water, grease cups applied to pump bearings, lengthen life of pump. Furnished with grease cups at slight additional cost. See page 630.

Can be furnished, when required, with relief valve which acts as emergency safety valve. Relief valves are adjustable for pressures from 15 to 75 lbs. (55 lbs. on No. 1); they are set at the factory to release at 30 lbs. (approx.)

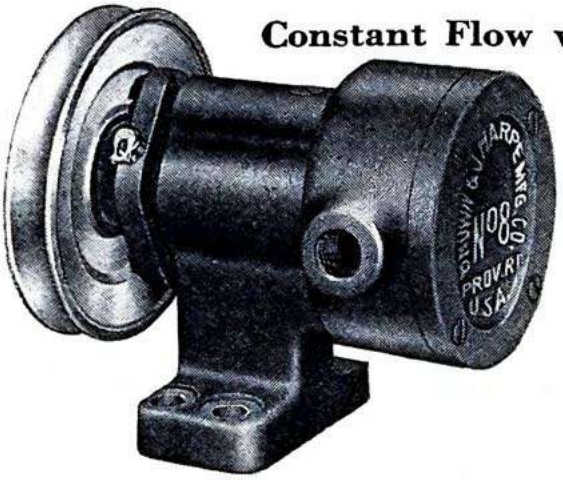
Furnished without relief valve and with pulley unless otherwise ordered.

Pump No.	R.P.M.	Capacity Gals. per Min. at 0 Lbs. Pressure	Suction and Discharge Pipe Connection, Inches	*Pulley Diam., Inches	Belt Width, Inches	Keyway, Inches	Net Weight, with Pulley, Lbs.
1S	600–1200	1 1-2 to 3 1-4	3-8	3 7-16	1	1-8 x 5-8	7
2S	600–1200	3 to 6 1-4	1-2	4 1-4	1	3-16 x 3-4	12
3S	600–1200	5 3-4 to 11 1-2	3-4	5	1 1-4	3-16 x 1	22 1-2

Pump No.	Without Pulley Without Relief Valve	Without Pulley With Relief Valve	With Pulley Without Relief Valve	With Pulley With Relief Valve
1S	**$12.00**	**$13.00**	**$13.00**	**$14.00**
2S	**14.00**	**15.50**	**15.50**	**17.00**
3S	**16.00**	**17.75**	**18.00**	**19.75**

*Larger pulleys for pressure work, furnished at extra cost.

No. 8 Vane Pump



Constant Flow with Pump Running in Either Direction

For circulating oil to the cutting tools of light metal working machines, or for lubricating mechanical units.

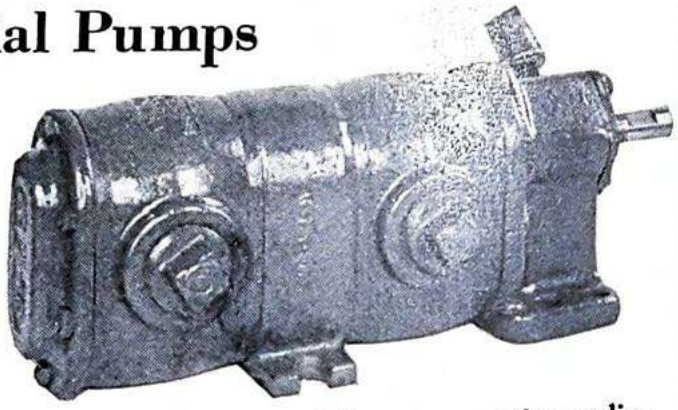
Two vanes rotate in an eccentric ring and produce alternately suction and compression. The pump discharges constant flow in one direction regardless of direction of rotation of driving shaft. However, either side of pump can be used for suction by moving stops on eccentric ring to right or left of pins in the case. Screw on top of stand permits lubricating bearings; if desired screw can be replaced by grease cup or oiler.

To obtain best results pump should be placed as near as possible to liquid level.

Pump No.	R.P.M.	Capacity Gals. per Min. at 0 Press.	Suction & Disch. Conn., Inches	Pulley Diam., Inches	V Belt Width, Inches	Net Wt. with Pulley, Lbs.	Price	
							Without Pulley	With Pulley
8	100–500	1-4 to 1	1-4	3 1-2	1-2	5 1-4	$8.50	$9.00

Special Pumps

To be inserted in power line of a hydraulically operated machine. Another type, not shown, has special gears to serve as booster pump on fire fighting apparatus.



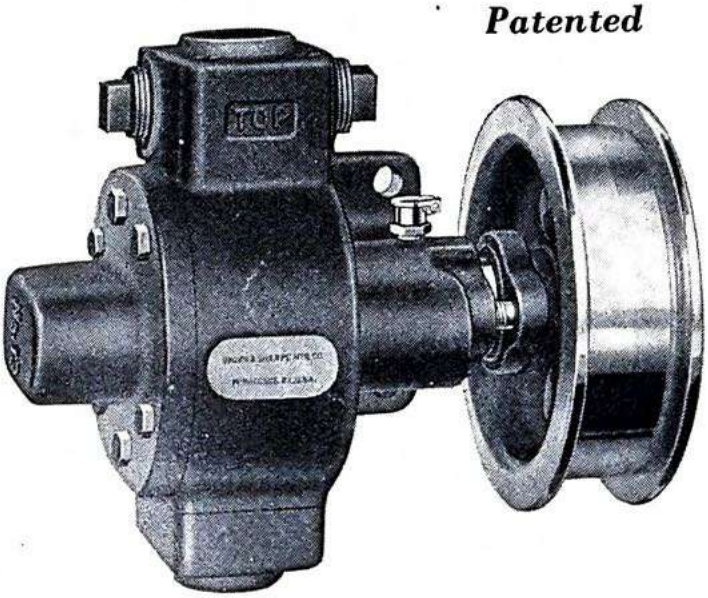
Duplex type with two operating cylinders for hydraulic operation of machine. We have produced countless special pumps for many fields of industry.

We are equipped to furnish special pumps for paint, enamel, sizing and other viscous liquids and, also, to furnish special mountings for adapting pumps as parts of machinery. Frequently, parts from stock pumps can be utilized at appreciable savings in making special pumps. Complete pump folder sent on request.

Nos. 11, 12 and 13 Rotary Geared Pumps

Constant Flow with Pump Running in Either Direction

Patented



Well adapted for use on machines that reverse. Provide constant flow with pump running in either direction.

Simple in construction, the principal mechanism being a pair of gears which run together in a tight case. Valve case may be transposed with bottom case, so that foot will be at either right or left, but foot must always be in a vertical position and valve case marked "Top" must always be at top of pump.

Performance of Nos. 11, 12 and 13 Pumps is similar to that of Nos. 1, 2 and 3 Pumps, respectively. Pressures, however, should be limited to approximately 100 lbs. per sq. inch when pumping oil. Complete pump folder sent on request.

Carried in stock with pulley on right-hand side, as shown. Furnished with pulley on left-hand side when specified.

No.	R.P.M.	Capacity, Gals. per Min., 0 Lbs. Pressure	Suction and Discharge Pipe Conn., Inches
11	300—900	1 1-2 to 4 1-2	3-8
12	300—900	3 to 9	1-2
13	300—900	5 1-2 to 16 1-2	3-4

No.	Pulley Diam., Inches	Belt Width, Inches	Keyway, Inches	Net Weight, with Pulley, Lbs.	Price	
					Without Pulley	With Pulley
11	3 7-16	1	1-8 x 5-8	10 1-2	**$12.75**	**$13.75**
12	4 1-4	1	3-16 x 3-4	15	**16.25**	**17.75**
13	5	1 1-4	3-16 x 1	28	**22.00**	**24.00**

Nos. 21 and 23 Bronze Rotary Geared Pumps

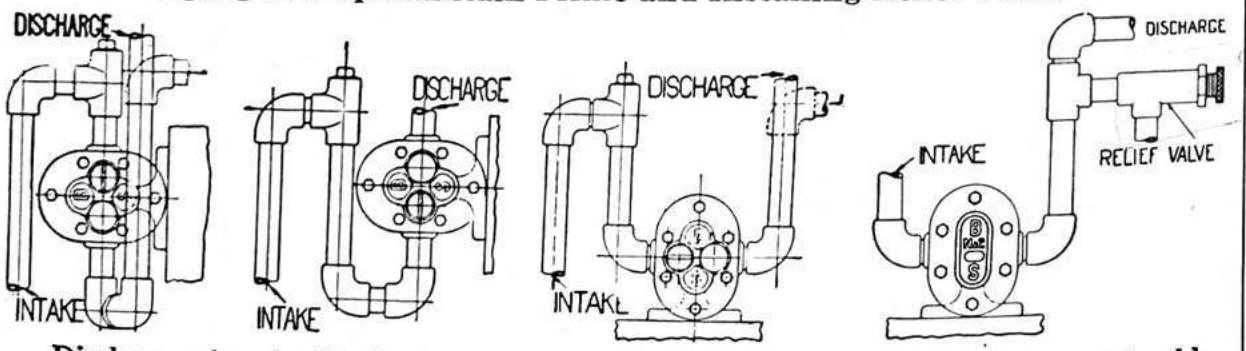
Patented

For use where a corrosion resisting pump is desired, such as for circulation on water-jacketed engines, pumping saline solutions, etc. Simple in construction, the principal mechanism being a pair of gears that run together in a tight case.

No. 21 Pump has bronze gears and shafts, but corrosion resisting steel gears and shafts can be furnished at extra cost. No. 23 Pump has corrosion resisting steel shafts, but bronze shafts can be furnished, if specified, at extra cost. Either side of the pump can be used for suction, thus allowing it to run in either direction. Performance of the Nos. 21 and 23 Pumps is identical with that of the Nos. 1 and 3 Pumps respectively, except that with the No. 21 Pump, when pumping water, pressure should not be over 25 lbs. per square inch with continuous load, or 40 lbs. per square inch momentary load; with No. 23 Pump when pumping water, pressure should not be over 20 lbs. with continuous load or 30 lbs. momentary load. Pumps should not exceed a maximum of 900 r.p.m. with grease cups or 500 r.p.m. without grease cups.

Pump No.	R.P.M.	Cap., Gals. per Min., at 0 Lbs. Press.	Suct. & Disch. Conn., Inches	Pulley Diam., Inches	Belt Width, Inches	Keyway, Inches	Nt. Wt. with Pulley Lbs.	Price	
								W'out Pulley	With Pulley
21	300–500	1 1-2 to 2 1-2	3-8	3 7-16	1	1-8x5-8	8	$19.00	$20.00
23	300–500	5 1-2 to 9	3-4	5	1 1-4	3-16x1	20	40.00	42.00

Piping to Help Maintain Prime and Installing Relief Valve.



Discharge pipe should rise at least as high as the top of the gooseneck in the intake line. Otherwise, the pumping liquid will be lost out of the discharge line.

Relief valve should be installed in the discharge line as shown.

Nos. 53 and 55 Rotary Geared Pumps

With Ball Bearings and Helical Gears

The Helical Gears are made with extreme accuracy, are quiet running and insure a steady flow.

For supplying oil under pressure for hydraulic operation of machines and, also, for pumping lubricating oil where quietness is essential. Discharge large volumes at high pressures and run quietly at high speeds.

Designed to be driven direct but have provision for pulley drive. Grease cup lubricates driving shaft. No adjustment of shaft packing necessary.

Pumps run in one direction only, either right-hand (clockwise) or left-hand (counter clockwise). The hand is determined by the direction in which the shaft rotates when viewed from the pulley or driven end. The direction of rotation is indicated by the arrow on top of the pump. In ordering, specify whether right-hand or left-hand rotation is desired.

Relief valve is not incorporated in pump. Because of large volumes pumped at high pressures it is recommended that relief valve be placed in discharge line and overflow returned to tank.

Caution:—These pumps should not be used for pumping cutter lubricant or coolant, as the helical gears are very closely fitted and damage may result from chips or grit in coolant.

Special circular, including performance charts, on application.

Pump No.	R.P.M.	Capac., Gals. per Min., at 0 Pressure	Suct. Conn. Inches	Discharge Conn. Inches	Keyway, Inches	Weight, Lbs.	Price	
							Without Pulley	*With Pulley
53	300-1800†	4 1-4 to 25 1-2	1	3-4	3-16 x 3-32	27	$50.00	$60.00
55	300-1200	9 to 36	1 1-4	1	3-16 x 3-32	32 1-2	55.00	65.00

*6″ Pulley, for 2¼″ belt, for either pump.

†For 1800 R.P.M., size of discharge pipe line should be increased immediately after leaving pump.

Nos. 101, 102 and 103 Rotary Geared Motorpumps

Horizontal Mounting

These are self-contained geared motorpumps—compact, efficient and neat. Save expensive power take-offs. Furnished for either horizontal or vertical mountings. Canopy can be furnished for vertical mountings to prevent dirt, chips, liquid, etc., entering motor. Simplicity and compactness in design are in keeping with modern trend. Helical gears in pump and reduction unit give quiet and smooth operation. Optional gear ratios, for pump speeds of either 600 R.P.M. or 900 R.P.M. can be furnished for different capacity requirements. Pumps run in either direction. Reversing motor reverses delivery. Complete pump folder sent on request.

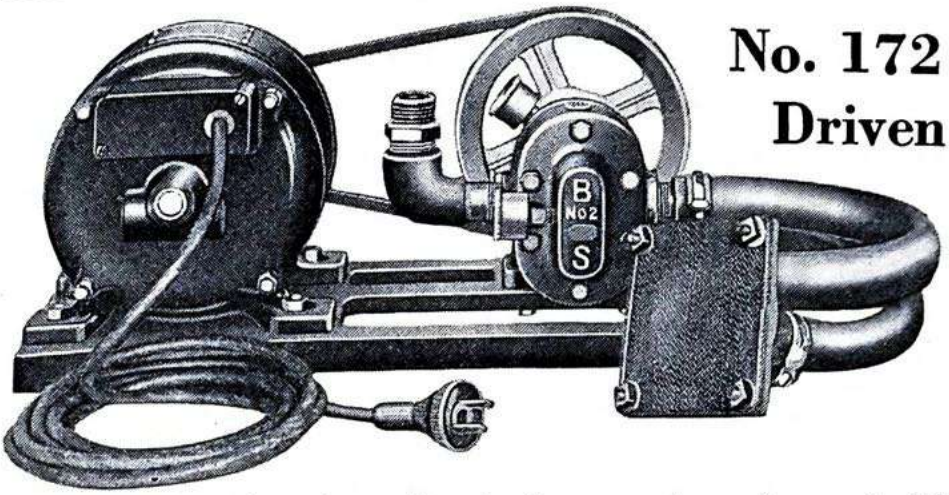
Pump No.	Capacity, Gals. per Min. at 0 Lbs. Pressure		Max. Operating Pressure Lbs. per sq. in. Lubricating Oil 200 S.U.V.		Suction & Discharge Pipe Connection, Inches	Motor H.P.	Net Weight, Lbs.	Price with **110 or 220 Volt Single Phase 60 Cycle Motors	Price with 440 Volt 3 Phase 60 Cycle Motors
	*600 R.P.M.	*900 R.P.M.	*600 R.P.M.	*900 R.P.M.					
101	3	4 1-2	50	20	1-2	1-6	42	$80.00	$90.00
102	6	9	25	10	3-4	1-4	45	92.00	100.00
103	12	18	25	10	1	1-2	63	112.00	115.00

*900 R.P.M. furnished, unless otherwise ordered.

**110-220 volts, single phase, 60 cycle, carried in stock. It is possible to connect these motors to either a two or three phase circuit but polyphase motors for 2 or 3 phase circuits can be furnished at extra cost. Motors for other current characteristics can be furnished. Price on application.

For somewhat higher pressures motors to ½ H.P. can be furnished for Nos. 101 and 102 Pumps. Price on application. With ½ H.P. motor, No. 101 Pump at 600 R.P.M. will operate to 160 lbs. per sq. in.; No. 102 Pump to 55 lbs. per sq. in.: at 900 R.P.M., No. 101 Pump will operate to 80 lbs. per sq. in., No. 102 Pump will operate to 30 lbs. per sq. in.

Canopy, for Vertical mounting, **price**.....**$4.25 extra**



No. 172 Motor Driven Cellar Drain Pump

Intended primarily for cellar drainage and can be used without digging hole in cellar bottom. Its design also adapts this pump for other uses where a compact motor driven unit is desirable.

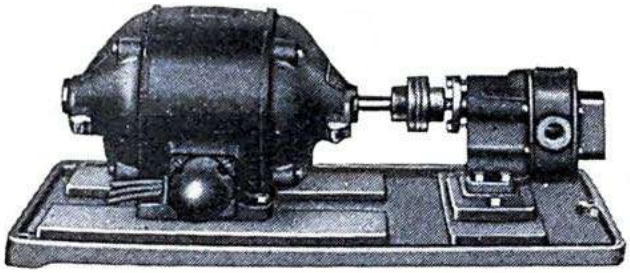
To use, merely attach ¾″ garden hose to discharge and connect electric cord. Pump is powerful and economical and intended for pressure up to 20 lbs. per sq. in. A V Belt insures positive drive and is adjustable. Bronze gears and shafts with grease cups for bearings to reduce wear.

Complete unit includes pump, alternating current ¼ H.P. motor 110 volt, 60 cycle, single phase, base, pulleys, V belt, 3 ft. of suction hose with strainer, ¾″ hose connection and 10 ft. of rubber covered cord and plug.

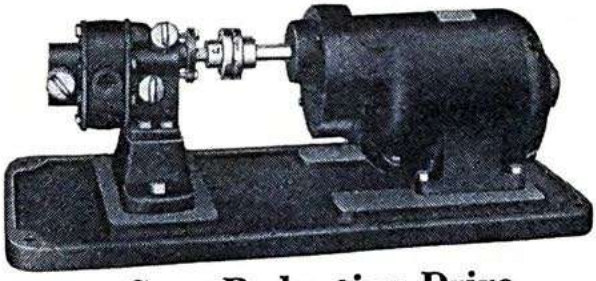
Pump No.	Capacity, Gallons Per Hour at 0 Lbs. Pressure	Length Overall, Inches	Width Overall, Inches	Height Overall, Inches	Net Weight, Lbs.	Price
172	300 to 350	22	8	7 1-4	47	**$32.00**

Geared Pump only, with grease cups but without pulley and fittings, **price**. **$12.00**

Motor Drive Pump Sets



Direct Drive



Gear Reduction Drive

We are in a position to furnish Motor Drive Pump Sets complete with Bases with or without motors. Price upon application, upon receipt of electrical and pump specifications.

Bases are kept in stock in the following sizes: 11½″ x 23½″, 17″ x 20″, 17″ x 27″ and 17″ x 31″.

No. 210 Centrifugal Motorpump

Desirable for large volumes and where solid particles or abrasive may be in liquid. Materials have been carefully chosen to insure long life and dependability. Pump impeller shaft and shaft housing are bronze and impeller case is cast iron. Lower motor bearing is sealed ball bearing, radial thrust. Motor is drip proof type and liquid cannot rise to motor. Pump is 20 29/32″ overall. Can be mounted outside tank or in it. Discharge clears motor—no elbow needed—a convenience in piping.

In figuring discharge allowance should be made for loss of head due to friction and velocity in piping, including piping for suction.

Pumps can be furnished with depth of submergence up to 36″ and made of special materials to resist chemical corrosion. Prices on application.

*Performance

Discharge, Gals. per Minute at Pump Speeds of 1725 R. P. M.

Total Head, Feet	7	8	10	12	14	16	18	20
Water	68	65	59	53	46	39	29	14
Oil, 390 S.U.V.	37	36	34	31	27	23	17	8

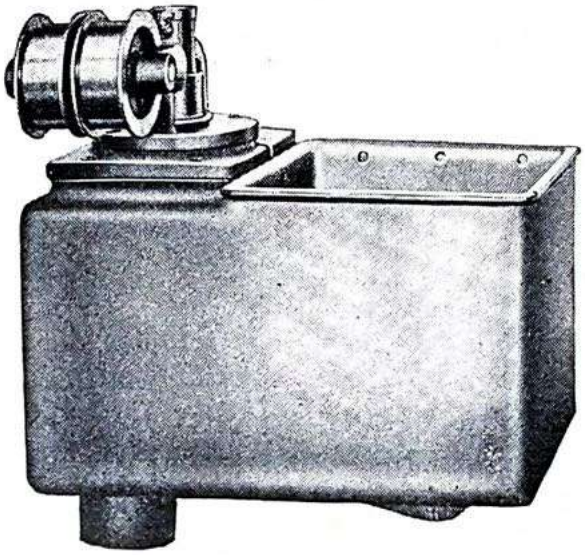
*Subject to slight variation.

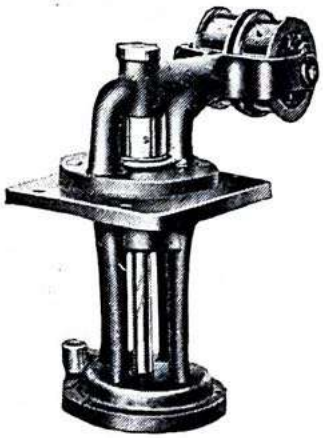
Pump No.	**¼ H.P. Motors	Suction Pipe Conn., Inches	Discharge Pipe Conn., Inches	R.P.M.	Net Weight	Price
210	Single Phase, 60 Cycle 110 Volt or 220 Volt	1½	1¼	1725	34	$70.00
	Three Phase, 60 Cycle 440 Volt	1½	1¼	1725	34	86.00

**In ordering specify whether 110, 220 or 440 volt motor is desired.

2 or 3 phase, 220, 440 or 550 volt motors can be furnished in 25 or 50 cycles, 1450 R.P.M.; or 2 phase 440 volt, or 2 or 3 phase 220 or 550 volt 60 cycles 1725 R.P.M. D.C. Motors, from 110 to 250 volts can be furnished, also. Prices on request.

No. 2 Centrifugal Water Pump





For use with water only. As the bearings do not come in contact with the water, these pumps may be used on grinding or other machines where the water contains a large amount of abrasive or grit.

The pump consists of a simple fan revolving in a case. The fan revolves in a horizontal plane and is immersed in the water. By this method the pump is constantly primed and there is no leakage from loose packings. These pumps develop no suction pressure.

The driving belt, which makes a quarter turn around the idler pulleys furnished with the pump, can run over the countershaft or over pulleys connected with some part of the machine.

The bracket, which supports the idler pulleys, is designed to allow setting in any desired position.

Pump No.	R.P.M.	Head, Feet					Discharge Pipe Size, Inches	Net Weight, Lbs.
		4	6	8	10	12		
		Approx. Capacity, Gallons per Minute						
2	1000	3 3-4	....	....	....	....	3-8	40
	1500	8 1-2	7 1-4	6 1-4	4 3-4	3		

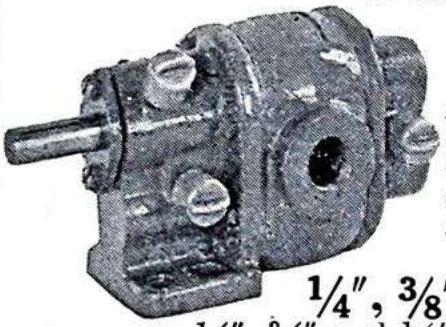
Driving Pulley, 2″ diameter for 1″ belt.

No. 2 Pump only (price does not include tank), **Price, $25.00.**

Tank for No. 2 Pump

Tank, provided with a settling pan and plug to draw off the water, can be furnished when desired. A tank is shown in the cut above.
Weight, 83 lbs. Cap., 6 gals.....**Price, $20.00**

Pump Accessories



Grease Cups

Unless their use makes grease objectionable, geared pumps used for water should be lubricated by grease cups. If grease cups are desired they should be specified when ordering pump. Prices on application.

1/4", 3/8", 1/2" and 3/4" Relief Valves

1/4", 3/8" and 1/2" valves are for pressures not exceeding 25 lbs. per square inch; the 3/4" valve for pressures not exceeding 60 lbs. Springs for higher pressures can be furnished at slight additional cost.

Size, Inches	Price	Size, Inches	Price
1-4	$1.60	1-2	$2.50
3-8	2.20	3-4	3.50

1" Relief Valve

Price, $10.00

For higher pressures as on hydraulically operated machines. Springs furnished are set for 100 lb. per square inch pressure and are adjustable to a maximum working pressure of 200 lbs. Heavier springs for pressures up to 300 lbs. can be furnished at extra cost.

Check Valve

Size, Inches	Price
3/8"	$1.00
1/2"	1.10
3/4"	1.25

Valve

Size, Inches	Price
1/2"	$6.50
3/4"	7.50
1"	9.00

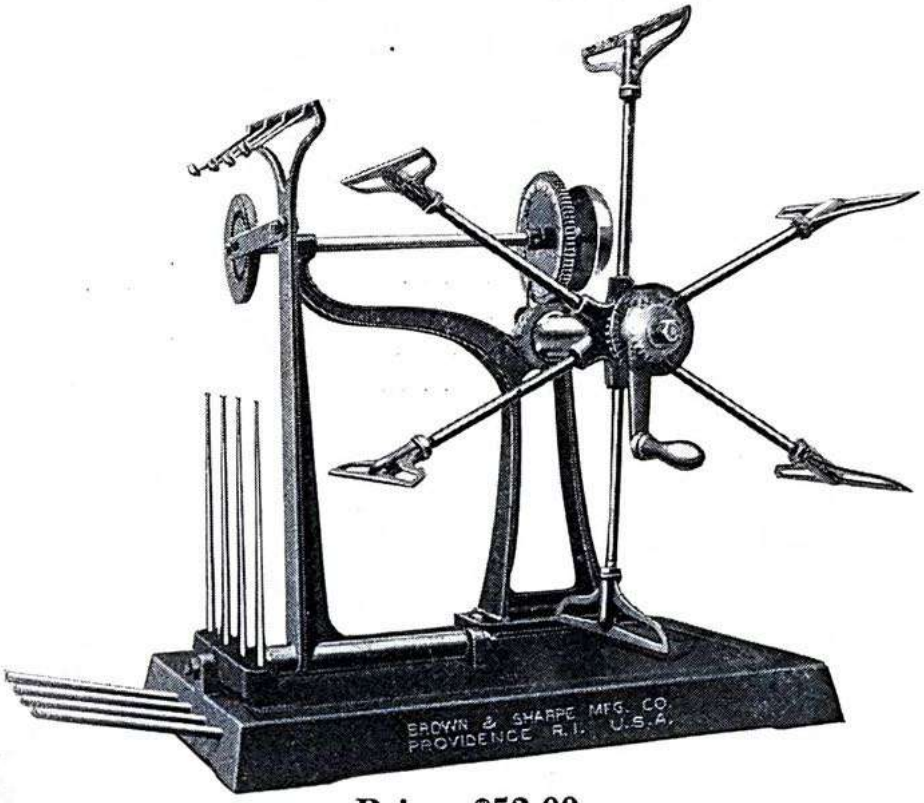
Strainers

These strainers of perforated tin have a mesh of one hundred and forty-four 3/64" holes per square inch. Finer mesh furnished at extra cost.

	Price
For No. 8 Pump, 1 5/8" x 2 3/8" x 3 1/8", Pipe Size 1/4"	$1.25
For Nos. 1, 1S & 11 Pumps, 1 7/8" x 3 1/8" x 4 5/8", Pipe Size 3/8"	1.70
For Nos. 2, 2S & 12 Pumps, 2 3/8" x 3 5/8" x 6 1/8", Pipe Size 1/2"	2.00
For Nos. 3, 3S & 13 Pumps, 3 1/8" x 4 5/8" x 7 1/8", Pipe Size 3/4"	2.50

Yarn Reel No. 975

975



Price, $52.00

These Yarn Reels reel yarns accurately for counts and are used in connection with roving scales and yarn testers when obtaining the stretch, strength and number of cotton, woolen, worsted, linen, silk, rayon and other yarns.

The reels are made with four or seven spindles and in two sizes, 36″ and 54″ in circumference.

The dial of the 36″ reel is graduated into 80 parts; that of the 54″ reel is graduated into 120 parts, indicating the number of yards reeled from each spindle. The number of yards reeled is indicated on the dial. An automatic feed motion lays the yarn flat upon the reel, securing accurate and uniform measurement for determining stretch, strength and numbering. The yarn guides and spindles are kept in line with each other while feeding yarn upon the reel, a very desirable feature when reeling fine yarns. The long yarn guides are used to increase the tension upon the yarn by taking a half turn or more of yarn around them. The bell rings a few turns before the zero of the dial reaches the index point.

Instructions and tables for using Reel and for numbering yarns are furnished with it.

Data for Use with the Yarn Reel

Testing Yarn For Count by Reeling 120 Yards—Indirect System

To Obtain Number of Yarn:—Reel 120 yards in all cases and divide the constant by the weight in grains.

The constants are derived in this manner:

$$\frac{120 \text{ yards} \times 7000 \text{ (grains, per pound)}}{\text{Standard Number for Material}} = \text{Constant.}$$

977

Constants for different materials:

Cotton	1000.	Cut-Wool	2800.	Ramie	2800.
Spun-Silk	1000.	Linen	2800.	Skein-Wool	3281.25
Worsted	1500.	Jute	2800.	Asbestos	8400.
Run-Wool	525.	China-Grass	2800.		

Illustration: 120 yards of cotton weighs 50 grains.
Solution: 1000 ÷ 50 = 20 cotton or its equivalent.

Testing Yarn For Count by Reeling 120 Yards—Direct System

To Obtain Denier Count:—Reel 120 yards in all cases and multiply constant by the weight in grains.

The constant is derived in this manner:

$$\frac{\text{Standard Number}}{120 \text{ yards} \times \text{grains per pound}} = \text{Constant.}$$

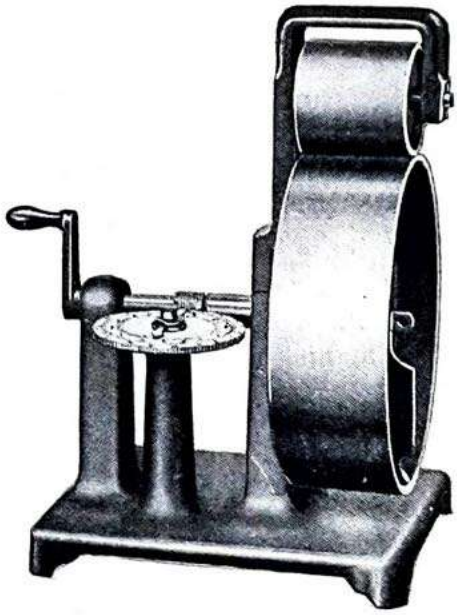
Constant for Denier Counts:

Raw-Silk 5.314
Illustration 1:
120 yds. Rayon weighs 28 grains.

Rayon (All Kinds) 5.314
Solution:
5.314 × 28 = 148.8 Rayon counts or Denier-Rayon.

Illustration 2:
120 yds. raw-silk weighs 3 grains.

Solution:
5.314 × 3 = 15.9 Denier-Silk.



Roving Reel No. 977

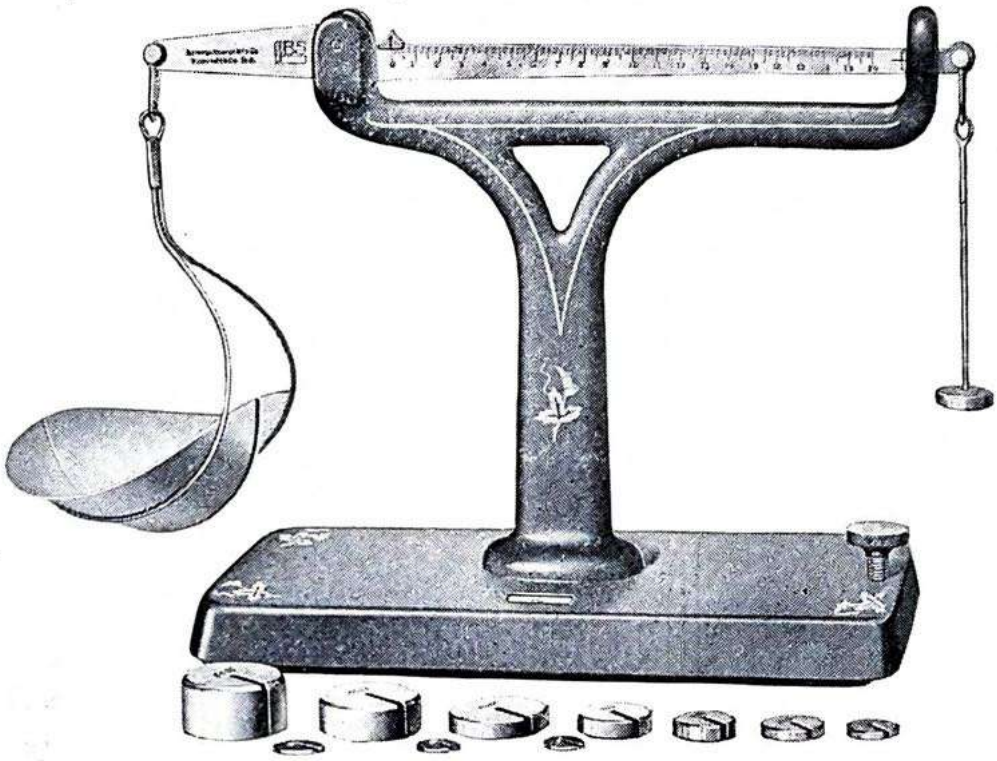
Price, $30.00

For reeling small quantities of roving, drawing and yarn and also to determine the number of twist in yarn.
Circumference of large drum, 18″.

Roving or Yarn Scales No. 980

Weighs 0 to 1 lb. Avoirdupois
by tenths of grains

980



Price, $19.00

These scales weigh up to one pound by tenths of grains, or seventy-thousandth parts of one pound avoirdupois, and are especially useful in connection with Yarn Reels No. 975 for numbering yarn, as they give the weight in tenths of grains to compare with tables. They also are useful for weighing roving or fabrics, and any small articles, colors, drugs, etc., and for computation of large quantities. Scoop is of monel metal and weights of stainless iron to resist corrosion. Other finished parts are nickel plated and stand is black japanned. Scale is set true by adjusting screw and spirit level in center of base.

Ten balancing weights are furnished as follows: One each 20, 30, 50, 100, 200, 300, 500, 1000, 2000 and 3000 grains; the 20 grains on the beam are each divided into 10 parts. Weights are furnished in finished wooden case.

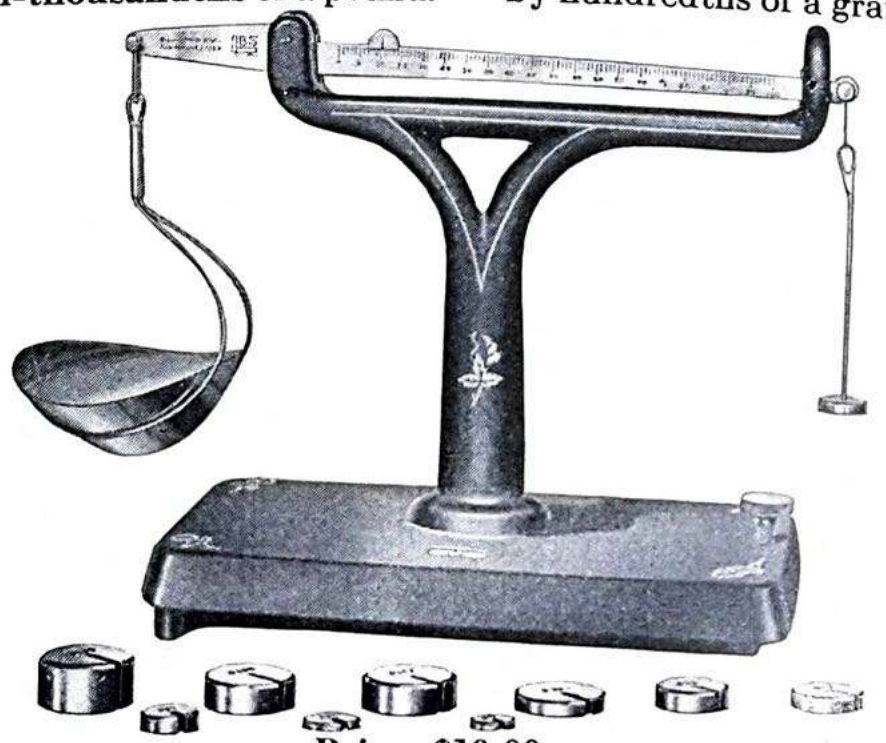
One pound	avoirdupois	=	7000	grains
1-2 "	"	=	3500	"
1-4 "	"	=	1750	"
1-8 "	"	=	875	"
One ounce	"	=	437.5	"

Sample Weighing Scales No. 982

ENGLISH MEASURE
Weighs 0 to 1 lb. Avoirdupois
by ten-thousandths of a pound.

METRIC MEASURE
Weighs 0 to 500 Grammes
by hundredths of a gramme.

982



Price, $19.00

These scales accurately weigh small articles, screws, samples of paper, color, drugs, etc., and are useful for computing large quantities. Valuable in screw machine shops for estimating scrap closely, by comparing weight of finished sample with weight of stock. Metric measure scales are used in die houses and chemical laboratories.

Scoop is of monel metal and weights of stainless iron to resist corrosion. Other finished parts are nickel plated and stand is black japanned. Scale is set true by adjusting screw and spirit level in center of base. Weights are furnished in finished wooden case.

English Measure Scales. Nine balancing weights are furnished of the following weights: 100, 200, 400, 800, 1000, 2000, 2000, 4000 ten-thousandths of a pound and a one-ounce weight for postal weighing.

Metric Measure Scales. Ten balancing weights are furnished of the following weights: 1, 2, 5, 10, 20, 40, 60, 100, 100 and 200 grammes.

7000 grains equal one pound avoirdupois.

One	ten-thousandth	of a	pound	equals		7-10	of a	grain	
156 1-4	ten-thousandths	"	"	"	equal	1-4	of an	ounce	
312 1-2	"	"	"	"	"	1-2	"	"	"
468 3-4	"	"	"	"	"	3-4	"	"	"
625	"	"	"	"	"	1	ounce		
2500	"	"	"	"	"	1-4	of a	pound	
5000	"	"	"	"	"	1-2	"	"	"
7500	"	"	"	"	"	3-4	"	"	"

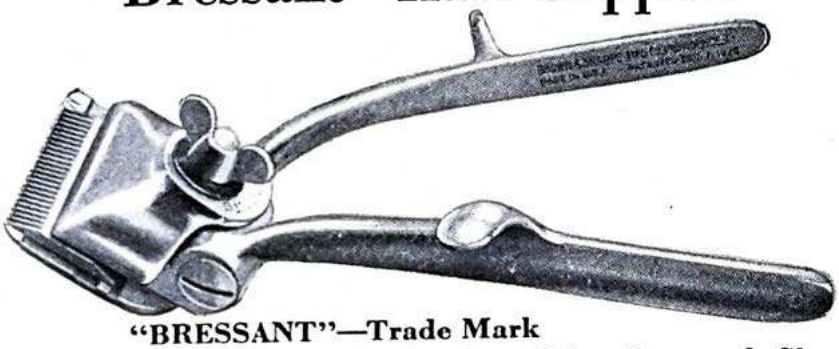
Hair Clippers

World known for their lasting qualities, smooth cutting action, and ease of operation. The choice of almost all professional users who must have reliable clippers in their work. Equally desirable and dependable for home use.

The chromium plated finish on all Brown & Sharpe Clippers resists rusting and staining and, also, pitting of bottom plate. All styles have full spiral spring that will last indefinitely.

These clippers cut cleanly without any tendency to coarsen the hair or irritate the skin.

"Bressant" Hair Clippers



"BRESSANT"—Trade Mark

This popular design, originally developed by Brown & Sharpe Mfg. Co., permits cleaning clipper without removing spring. Made in eight sizes. Bottom plates are about 2″ wide and interchangeable on all sizes.

No. 0000	Cuts hair extremely close (nearly as close as shaving)	$4.50
No. 000	Cuts hair close (about one hundredth of an inch long)	4.50
No. 00	Cuts hair one sixty-fourth of an inch long	4.50
No. 0	Cuts hair one thirty-second of an inch long	4.50
No. 0A	Cuts hair three sixty-fourths of an inch long	4.50
No. 1	Cuts hair one eighth of an inch long	4.50
No. 2	Cuts hair one quarter of an inch long	5.00
No. 3	Cuts hair five sixteenths of an inch long	5.50

"Narrow Plate" Hair Clippers

Small and light weight. Suitable for beauty shops and for finishing the hair cut. Bottom plates about 1½″ wide and interchangeable on all sizes.

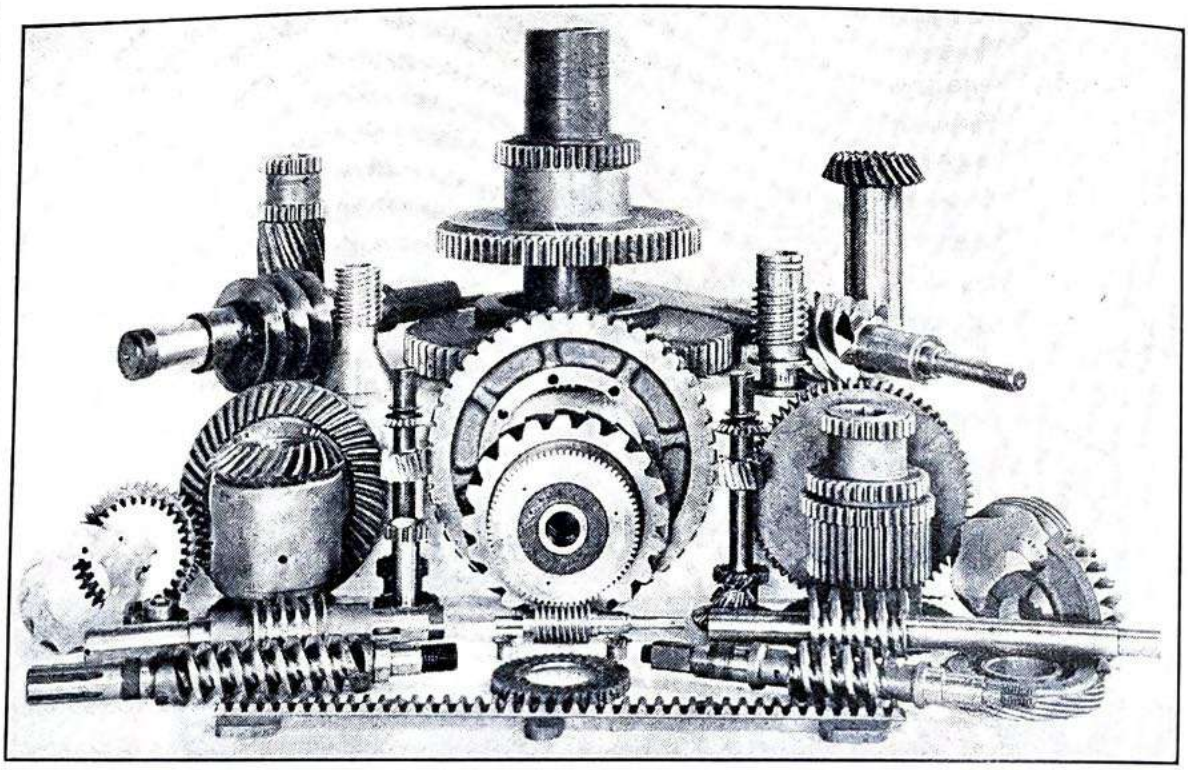
No. 0000	Cuts hair extremely close (nearly as close as shaving)	$4.50
No. 000	Cuts hair close (about one hundredth of an inch long)	4.50
No. 00	Cuts hair one sixty-fourth of an inch long	4.50

Each of the above packed one in a box.

Sharpening and Repairing

We recommend returning clippers to factory for sharpening and repair, as special equipment is essential to sharpen clippers properly and we have a department devoted to this work. **For more complete information send for separate Hair Clipper Catalog.**

Gears



We operate a completely equipped Gear Department for furnishing our customers with high quality gears, made to their specifications in the following types and sizes:

Spur Gears to 72″ diameter
Generated Bevel Gears to 18″ diameter, both spiral and straight tooth bevel gears
Spiral or Helical Spur Gears to 36″ diameter
Worm Gears to 96″ diameter
Cut Worms to correspond
Worms ground in the threads, up to 8″ diameter
Racks, Clutches, Sprockets, etc.

The most up-to-date equipment is used for cutting, hardening, grinding, and testing, and the benefit of the experience of over one hundred years of precision gear cutting is at the service of our customers.

Brown & Sharpe Gears are regularly fulfilling the most exacting requirements of manufacturers of high grade products, including aeronautical motors, machine tools, oil burners, refrigerating machinery, talking motion picture machines, electric trucks, hoisting equipment, turbine governors, etc.

Detailed information is desirable with orders and inquiries. Where possible send blueprints showing mating gears, tolerances on all dimensions, tooth form, allowable backlash and material. Also advise horsepower transmitted, R.P.M. and any other available data.

Publications

We issue the following publications. Sent upon receipt of the nominal charges listed below:

Practical Treatise on Milling and Milling Machines
Price, Cloth Cover, **$1.50.** Paper Cover, **$1.00.**

Construction and Use of Automatic Screw Machines
Includes instructions for designing and machining cams.
Price, Paper Cover, **$1.00.**

Construction and Use of Universal Grinding Machines
Price, Paper Cover, **50 cents.**

Construction and Use of No. 13 Universal & Tool Grinding Machine
Includes and describes numerous set-ups.
Price, Paper Cover, **50 cents.**

Construction and Use of No. 2 Cutter Grinding Machine and No. 3 Universal Cutter and Reamer Grinding Machine
Contains directions for grinding cutters.
Price, Paper Cover, **50 cents.**

Care and Use of Automatic Gear Cutting Machines
Contains instructions for cutting spur and bevel gears.
Price, Paper Cover, **50 cents.**

Construction and Use of Gear Hobbing Machines
Price, Paper Cover, **50 cents.**

Practical Treatise on Gearing
Contains tables and illustrations, and is written for those who wish to obtain practical explanations and descriptions for making gears.
Price, Cloth Cover, **$1.50.** Paper Cover, **$1.00.**

Formulas in Gearing
Supplements the "Practical Treatise on Gearing," and contains formulas for gearing problems. Very useful for draftsmen.
Price, Cloth Cover, **$1.50.**

Brown & Sharpe Handbook
To assist the learner in the use of machine and machinists' tools.
Price, Imitation Leather Cover, **75 cents.**

Decimal and Millimeter Equivalents of Fractional Parts of an Inch

Inches		Inches	mm	Inches		Inches	mm
	1-64	.01563	.397		33-64	.51563	13.097
1-32		.03125	.794	17-32		.53125	13.494
	3-64	.04688	1.191		35-64	.54688	13.890
1-16		.0625	1.587	9-16		.5625	14.287
	5-64	.07813	1.984		37-64	.57813	14.684
3-32		.09375	2.381	19-32		.59375	15.081
	7-64	.10938	2.778		39-64	.60938	15.478
1-8		.125	3.175	5-8		.625	15.875
	9-64	.14063	3.572		41-64	.64063	16.272
5-32		.15625	3.969	21-32		.65625	16.669
	11-64	.17188	4.366		43-64	.67188	17.065
3-16		.1875	4.762	11-16		.6875	17.462
	13-64	.20313	5.159		45-64	.70313	17.859
7-32		.21875	5.556	23-32		.71875	18.256
	15-64	.23438	5.953		47-64	.73438	18.653
1-4		.25	6.350	3-4		.75	19.050
	17-64	.26563	6.747		49-64	.76563	19.447
9-32		.28125	7.144	25-32		.78125	19.844
	19-64	.29688	7.541		51-64	.79688	20.240
5-16		.3125	7.937	13-16		.8125	20.637
	21-64	.32813	8.334		53-64	.82813	21.034
11-32		.34375	8.731	27-32		.84375	21.431
	23-64	.35938	9.128		55-64	.85938	21.828
3-8		.375	9.525	7-8		.875	22.225
	25-64	.39063	9.922		57-64	.89063	22.622
13-32		.40625	10.319	29-32		.90625	23.019
	27-64	.42188	10.716		59-64	.92188	23.415
7-16		.4375	11.113	15-16		.9375	23.812
	29-64	.45313	11.509		61-64	.95313	24.209
15-32		.46875	11.906	31-32		.96875	24.606
	31-64	.48438	12.303		63-64	.98438	25.003
1-2		.5	12.700	1		1.00000	25.400

Decimal Inch Equivalents of Millimeters and Fractions of Millimeters

mm	Inches	mm	Inches	mm	Inches	mm	Inches
1-100	= .00039	33-100	= .01299	64-100	= .02520	95-100	= .03740
2-100	= .00079	34-100	= .01339	65-100	= .02559	96-100	= .03780
3-100	= .00118	35-100	= .01378	66-100	= .02598	97-100	= .03819
4-100	= .00157	36-100	= .01417	67-100	= .02638	98-100	= .03858
5-100	= .00197	37-100	= .01457	68-100	= .02677	99-100	= .03898
6-100	= .00236	38-100	= .01496	69-100	= .02717	1	= .03937
7-100	= .00276	39-100	= .01535	70-100	= .02756	2	= .07874
8-100	= .00315	40-100	= .01575	71-100	= .02795	3	= .11811
9-100	= .00354	41-100	= .01614	72-100	= .02835	4	= .15748
10-100	= .00394	42-100	= .01654	73-100	= .02874	5	= .19685
11-100	= .00433	43-100	= .01693	74-100	= .02913	6	= .23622
12-100	= .00472	44-100	= .01732	75-100	= .02953	7	= .27559
13-100	= .00512	45-100	= .01772	76-100	= .02992	8	= .31496
14-100	= .00551	46-100	= .01811	77-100	= .03032	9	= .35433
15-100	= .00591	47-100	= .01850	78-100	= .03071	10	= .39370
16-100	= .00630	48-100	= .01890	79-100	= .03110	11	= .43307
17-100	= .00669	49-100	= .01929	80-100	= .03150	12	= .47244
18-100	= .00709	50-100	= .01969	81-100	= .03189	13	= .51181
19-100	= .00748	51-100	= .02008	82-100	= .03228	14	= .55118
20-100	= .00787	52-100	= .02047	83-100	= .03268	15	= .59055
21-100	= .00827	53-100	= .02087	84-100	= .03307	16	= .62992
22-100	= .00866	54-100	= .02126	85-100	= .03346	17	= .66929
23-100	= .00906	55-100	= .02165	86-100	= .03386	18	= .70866
24-100	= .00945	56-100	= .02205	87-100	= .03425	19	= .74803
25-100	= .00984	57-100	= .02244	88-100	= .03465	20	= .78740
26-100	= .01024	58-100	= .02283	89-100	= .03504	21	= .82677
27-100	= .01063	59-100	= .02323	90-100	= .03543	22	= .86614
28-100	= .01102	60-100	= .02362	91-100	= .03583	23	= .90551
29-100	= .01142	61-100	= .02402	92-100	= .03622	24	= .94488
30-100	= .01181	62-100	= .02441	93-100	= .03661	25	= .98425
31-100	= .01220	63-100	= .02480	94-100	= .03701	26	= 1.02362
32-100	= .01260	.....		.....		.....	

In accordance with the standard practice approved by the American Standards Association, the ratio 25.4 mm = 1 inch is used for converting millimeters to inches. This factor varies only two millionths of an inch from the more exact factor 25.40005 mm, a difference so small as to be negligible for industrial length measurements.

Metric Measures

The metric unit of length is the meter = 39.37 inches.

The metric unit of weight is the gramme = 15.432 grains.

The following prefixes are used for sub-divisions and multiples: Milli = $\frac{1}{1000}$, Centi = $\frac{1}{100}$, Deci = $\frac{1}{10}$, Deca = 10, Hecto = 100, Kilo = 1000, Myria = 10,000.

Metric and English Equivalent Measures

MEASURES OF LENGTH

Metric	*English*
1 meter	= 39.37 inches, or 3.28083 feet, or 1.09361 yards
.3048 meter	= 1 foot
1 centimeter	= .3937 inch
2.54 centimeters	= 1 inch
1 millimeter	= .03937 inch, or nearly 1-25 inch
25.4 millimeters	= 1 inch
1 kilometer	= 1093.61 yards, or 0.62137 mile

MEASURES OF WEIGHT

Metric	*English*
1 gramme	= 15.432 grains
.0648 gramme	= 1 grain
28.35 grammes	= 1 ounce avoirdupois
1 kilogramme	= 2.2046 pounds
.4536 kilogramme	= 1 pound
1 tonne or metric ton 1000 kilogrammes	= .9842 ton of 2240 pounds = 19.68 cwt. = 2204.6 pounds
1.016 metric tons 1016 kilogrammes	= 1 ton of 2240 pounds

MEASURES OF CAPACITY

Metric	*English*
1 liter (= 1 cubic decimeter)	= 61.023 cubic inches .03531 cubic foot .2642 gal. (American) 2.202 lbs. of water at 62° F.
28.317 liters	= 1 cubic foot
3.785 liters	= 1 gallon (American)
4.543 liters	= 1 gallon (Imperial)

Useful Information

To find the circumference of a circle, multiply the diameter by 3.1416.

To find the diameter of a circle, multiply the circumference by .31831.

To find the area of a circle, multiply the square of the diameter by .7854.

To find the surface of a ball (sphere), multiply the square of the diameter by 3.1416.

To find the side of a square equal in area to a given circle, multiply the diameter by .8862.

Doubling the diameter of a pipe increases its capacity four times.

The radius of a circle × 6.283185 = the circumference.

The square of the circumference of a circle × .07958 = the area.

Half the circumference of a circle × half its diameter = the area.

The circumference of a circle × .159155 = the radius.

The square root of the area of a circle × .56419 = the radius.

The square root of the area of a circle × 1.12838 = the diameter.

A gallon of water (U. S. standard) weighs 8½ pounds and contains 231 cubic inches. A cubic foot of water contains 7½ gallons, 1728 cubic inches, and weighs 62½ pounds at a temperature of about 39 degrees Fahrenheit.

These weights change slightly above and below this temperature.

Metric and English Conversion Tables

Measures of Length

1 meter = 39.37 inches, 3.28083 feet, 1.0936 yds.

1 centimeter = .3937 inch

1 millimeter = .03937 inch, or 1-25 inch nearly

1 kilometer = 0.62137 mile

1 foot = .3048 meter

1 inch = 2.54 centimeters, 25.4 millimeters

Allowances for Fits

The allowances given in the table below and on the opposite page are recommended for use in the manufacture of machine parts, to produce satisfactory commercial work. For special cases, it may be necessary to increase or decrease the allowances given in the table.

Running Fits for Shafts—Speeds Under 600 R.P.M.—Ordinary Working Conditions

Diameter, Inches	*Allowances, Inches*
Up to ½	− 0.0005 to − 0.001
½ to 1	− 0.00075 to − 0.0015
1 to 2	− 0.0015 to − 0.0025
2 to 3½	− 0.002 to − 0.003
3½ to 6	− 0.0025 to − 0.004

Running Fits for Shafts—Speeds Over 600 R.P.M.—Heavy Pressure—Working Conditions Severe

Up to ½	− 0.0005 to − 0.001
½ to 1	− 0.001 to − 0.002
1 to 2	− 0.002 to − 0.003
2 to 3½	− 0.003 to − 0.004
3½ to 6	− 0.004 to − 0.005

Sliding Fits for Shafts with Gears, Clutches, or Similar Parts which must be Free to Slide

Up to ½	− 0.0005 to − 0.001
½ to 1	− 0.00075 to − 0.0015
1 to 2	− 0.0015 to − 0.0025
2 to 3½	− 0.002 to − 0.003
3½ to 6	− 0.0025 to − 0.004

Continued on next page.

Allowances for Fits (*Continued*)

Standard Fits for Light Service where Part is Keyed to Shaft and Clamped Endwise—No Fitting

Diameter, Inches	*Allowances, Inches*
Up to ½	Standard to − 0.00025
½ to 3½	Standard to − 0.0005
3½ to 6	Standard to − 0.00075

Standard Fits with Play Eliminated—Parts Should Assemble Readily—Some Fitting and Selecting may be Required

Up to ½	Standard to + 0.00025
½ to 3½	Standard to + 0.0005
3½ to 6	Standard to + 0.00075

Driving Fits for Permanent Assembly of Parts so Located that Driving cannot be done readily

Up to ½	Standard to + 0.00025
½ to 1	+ 0.00025 to + 0.0005
1 to 2	+ 0.0005 to + 0.00075
2 to 6	+ 0.0005 to + 0.001

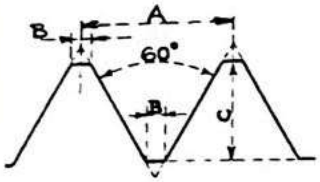
Driving Fits for Permanent Assembly and Severe Duty and where there is Ample Room for Driving

Up to 2	+ 0.0005 to + 0.001
2 to 3½	+ 0.00075 to + 0.00125
3½ to 6	+ 0.001 to + 0.0015

Forced Fits for Permanent Assembly and Very Severe Service—Hydraulic Press Used for Larger Parts

Up to ½	+ 0.00075 to + 0.001
½ to 1	+ 0.001 to + 0.002
1 to 2	+ 0.002 to + 0.003
2 to 3½	+ 0.003 to + 0.004
3½ to 6	+ 0.004 to + 0.005

American National Coarse and Fine Thread Dimensions and Tap Drill Sizes



$$A = \text{pitch} = \frac{1}{\text{No. of Threads per Inch}}$$

$$n = \text{Number of threads per inch}$$

$$C = \text{depth} = \text{pitch} \times .649519 \text{ or } \frac{.649519}{n}$$

$$B = \text{flat} = \frac{\text{Pitch}}{8}$$

Nominal Size	Outside Diameter, Inches	Pitch Diameter, Inches	Root Diameter, Inches	Tap Drill	Decimal Equivalent of Tap Drill
*0–80	.0600	.0519	.0438	3-64	.0469
*1–64	.0730	.0629	.0527	53	.0595
72	.0730	.0640	.0550	53	.0595
*2–56	.0860	.0744	.0628	50	.0700
64	.0860	.0759	.0657	50	.0700
*3–48	.0990	.0855	.0719	47	.0785
56	.0990	.0874	.0758	45	.0820
*4–40	.1120	.0958	.0795	43	.0890
48	.1120	.0985	.0849	42	.0935
*5–40	.1250	.1088	.0925	38	.1015
44	.1250	.1102	.0955	37	.1040
*6–32	.1380	.1177	.0974	36	.1065
40	.1380	.1218	.1055	33	.1130
*8–32	.1640	.1437	.1234	29	.1360
36	.1640	.1460	.1279	29	.1360
*10–24	.1900	.1629	.1359	25	.1495
32	.1900	.1697	.1494	21	.1590
*12–24	.2160	.1889	.1619	16	.1770
28	.2160	.1928	.1696	14	.1820
¼–20	.2500	.2175	.1850	7	.2010
28	.2500	.2268	.2036	3	.2130
5/16–18	.3125	.2764	.2403	F	.2570
24	.3125	.2854	.2584	I	.2720
⅜–16	.3750	.3344	.2938	5-16	.3125
24	.3750	.3479	.3209	Q	.3320
7/16–14	.4375	.3911	.3447	U	.3680
20	.4375	.4050	.3726	25-64	.3906
½–13	.5000	.4501	.4001	27-64	.3219
20	.5000	.4675	.4351	29-64	.4531
9/16–12	.5625	.5084	.4542	31-64	.4844
18	.5625	.5264	.4903	33-64	.5156
⅝–11	.6250	.5660	.5069	17-32	.5312
18	.6250	.5889	.5528	37-64	.5781
¾–10	.7500	.6850	.6201	21-32	.6562
16	.7500	.7094	.6688	11-16	.6875
⅞– 9	.8750	.8029	.7307	49-64	.7656
14	.8750	.8286	.7822	13-16	.8125
1– 8	1.0000	.9188	.8376	7-8	.8750
14	1.0000	.9536	.9072	15-16	.9375
1⅛– 7	1.1250	1.0322	.9394	63-64	.9844
12	1.1250	1.0709	1.0168	1 3-64	1.0469
1¼– 7	1.2500	1.1572	1.0644	1 7-64	1.1094
12	1.2500	1.1959	1.1418	1 11-64	1.1719

*American National Standard Wood Screws are made in same numbers and corresponding body diameters as starred sizes.

American National Coarse and Fine Thread Dimensions and Tap Drill Sizes

(*Continued*)

Nominal Size	Outside Diameter, Inches	Pitch Diameter, Inches	Root Diameter, Inches	Tap Drill	Decimal Equivalent of Tap Drill
1⅜– 6	1.3750	1.2667	1.1585	1 7-32	1.2187
12	1.3750	1.3209	1.2668	1 19-64	1.2969
1½– 6	1.5000	1.3917	1.2835	1 11-32	1.3437
12	1.5000	1.4459	1.3918	1 27-64	1.4219
1¾– 5	1.7500	1.6201	1.4902	1 9-16	1.5625
2 – 4½	2.0000	1.8557	1.7113	1 25-32	1.7812
2¼– 4½	2.2500	2.1057	1.9613	2 1-32	2.0312
2½– 4	2.5000	2.3376	2.1752	2 1-4	2.2500
2¾– 4	2.7500	2.5876	2.4252	2 1-2	2.5000
3– 4	3.0000	2.8376	2.6752	2 3-4	2.7500
3¼– 4	3.2500	3.0876	2.9252	3	3.0000
3½– 4	3.5000	3.3376	3.1752	3 1-4	3.2500
3¾– 4	3.7500	3.5876	3.4252	3 1-2	3.5000
4– 4	4.0000	3.8376	3.6752	3 3-4	3.7500

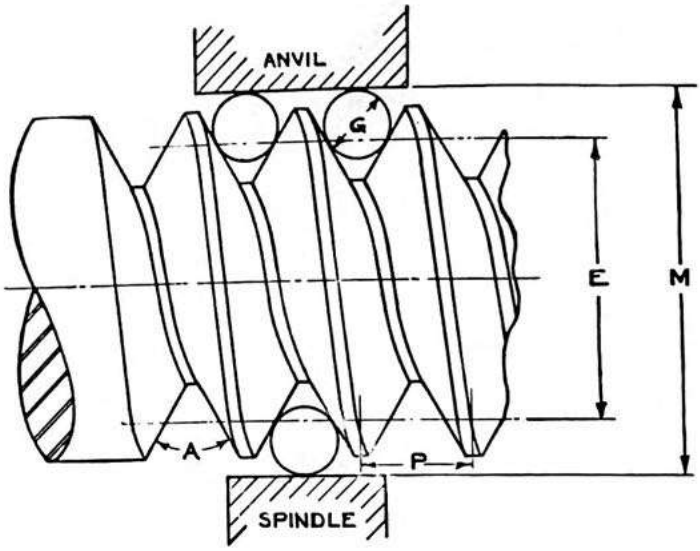
American National Pipe Thread Tap Drill Sizes

Sizes of Pipe, Inches	Number of Threads to Inch	Root Diameter Small End of Pipe and Gage, Inches	Tap Drill	
			Size	Decimal Equivalent
1-8	27	.3339	R	.339
1-4	18	.4329	7-16	.437
3-8	18	.5676	37-64	.578
1-2	14	.7013	23-32	.719
3-4	14	.9105	59-64	.921
1	11 1-2	1.1441	1 5-32	1.156
1 1-4	11 1-2	1.4876	1 1-2	1.500
1 1-2	11 1-2	1.7265	1 47-64	1.734
2	11 1-2	2.1995	2 7-32	2.218
2 1-2	8	2.6195	2 5-8	2.625
3	8	3.2406	3 1-4	3.250
3 1-2	8	3.7375	3 3-4	3.750
4	8	4.2344	4 1-4	4.250

V Threads

$$\text{Minor Diameter for V Thread} = \text{outside diameter of Screw} - \frac{1.732}{\text{Threads per inch}}$$

Example—Minor Diameter for ¾″ V Thread, 10 threads per inch = $.750'' - \frac{1.732''}{10} = .750'' - .1732'' = .5768''$, Minor Diameter.



Three Wire Method for Measuring Pitch Diameters

Wire Sizes and Formulae for 60° Threads

To find the Pitch Diameter (E)

(1) $E = M + 0.866025\ P - 3G$

To Calculate the Measurement over Wires (M)

(2) $M = E + 3G - 0.866025\ P$

E = Pitch Diameter P = Pitch

M = Measurement over Wires G = Diameter of Wires

Example:—Determine (M) Measurement over Wires for ½″—12 Pitch N. C.

Nominal Major Diameter	.500000″
Less Single Depth of 12 P. Natl. Std.	.054126″
Pitch Diameter is	.445874″

Size of Wire to use on 12 P is .0481125″ (See Table)

Using Formula (2)

$M = .445874'' + (3 \times .0481125'') - 0.866025\ P$

$M = .445874'' + .144337'' - .072168''$

$M = .445874'' + .072169''$

$M = .518043''$

By using different formulae, threads of other proportions can be accurately measured.

A wire that comes in contact with the side of the thread at the pitch line is called the "Best Size." Larger wires can be used, but the "Best Size" gives the reading at the important working part of the thread. (Smaller sizes come below the top of the thread.) The "Best Size" of wire for each pitch is given in the table on the following page.

Too much pressure should not be applied when measuring over wires. For pitches finer than 20 threads per inch a pressure of 1 pound is recommended and 2½ pounds for pitches of 20 threads per inch and coarser.

Wire Sizes

For Three Wire Thread Measurement of American National Form Threads

Wire Sizes	Threads per Inch								
	3	3¼	3½	4	4½	5	5½	6	7
.192450	*.28867	.31088	.32992						
.177646	.....	*.26647	.28551	.31643					
.164957	.....	.....	*.24744	.27837	.30242				
.144339	.....	.....	.....	*.21651	.24057	.25981			
.128300	.....	.....	.....	.....	*.19245	.21169	.22744		
.115470	.....	.....	.....	.....	.....	*.17321	.18895	.20207	
.104973	.....	.....	.....	.....	.....	.....	*.15746	.17058	.19120
.096225	.....	.....	.....	.....	.....	.....	.....	*.14434	.16496
.082479	.....	.....	.....	.....	.....	.....	.....	.....	*.12372

Wire Sizes	Threads Per Inch									
	8	9	10	11	11½	12	13	14	16	18
.096225	.18042									
.082479	.13918	.15121								
.072169	*.10825	.12028	.12990							
.064150	.....	*.09623	.10585	.11372						
.057735	.....	.....	*.08660	.09448	.09790					
.052486	.....	.....	.....	*.07873	.08215	.08529				
.050204	.....	.....	.....	.....	*.07531	.07844	.08400			
.048113	.....	.....	.....	.....	.....	*.07217	.07772	.08248		
.044412	.....	.....	.....	.....	.....	.....	*.06662	.07138	.07911	
.041239	.....	.....	.....	.....	.....	.....	.....	*.06186	.06959	.07561
.036084	.....	.....	.....	.....	.....	.....	.....	.....	*.05413	.06014
.032074	.....	.....	.....	.....	.....	.....	.....	.....	.....	*.04811

Wire Sizes	Threads Per Inch								
	19	20	22	24	26	27	28	30	32
.036084	.06267								
.032074	.05064	.05292							
.030387	*.04558	.04786	.05180						
.028868	.....	*.04330	.04724	.05052					
.026243	.....	.....	*.03937	.04265	.04542				
.024055	.....	.....	.....	*.03608	.03886	.04009			
.022205	.....	.....	.....	.....	*.03331	.03454	.03569		
.021383	.....	.....	.....	.....	.....	*.03208	.03322	.03528	
.020619	.....	.....	.....	.....	.....	.....	*.03093	.03299	.03480
.019245	.....	.....	.....	.....	.....	.....	.....	*.02887	.03067
.018042	.....	.....	.....	.....	.....	.....	.....	.....	*.02706

Wire Sizes	Threads Per Inch									
	34	36	40	44	48	50	56	64	72	80
.019245	.03226									
.018042	.02866	.03007								
.016980	*.02547	.02689	.02929							
.016037	.....	*.02406	.02646	.02843						
.014434	.....	.....	*.02165	.02362	.02526					
.013121	.....	.....	.....	*.01968	.02132	.02204				
.012028	.....	.....	.....	.....	*.01804	.01876	.02062			
.011547	.....	.....	.....	.....	.....	*.01732	.01918	.02111		
.010310	.....	.....	.....	.....	.....	.....	*.01546	.01740	.01890	
.009021	.....	.....	.....	.....	.....	.....	.....	*.01353	.01504	.01624
.008018	.....	.....	.....	.....	.....	.....	.....	.....	*.01203	.01323
.007217	.....	.....	.....	.....	.....	.....	.....	.....	.....	*.01083

* "Best Size" or Wire touching on pitch Diameter.

United States Standard Gage Sizes

For Sheet and Plate Iron and Steel

This is the recognized commercial standard for all uncoated sheet and plate iron and steel, and is the legal standard to be used in determining duties and taxes levied by the United States, under act of Congress approved March 3, 1893.

No. of Gage	Approximate Thickness, Inches, (Fractions)	Approximate Thickness, Inches, (Decimals)	Weight per Sq. Ft., Ounces, Avoirdupois	Weight per Sq. Ft., Pounds, Avoirdupois	No. of Gage	Approximate Thickness, Inches, (Fractions)	Approximate Thickness, Inches, (Decimals)	Weight per Sq. Ft., Ounces, Avoirdupois	Weight per Sq. Ft., Pounds, Avoirdupois
0000000	1-2	.5	320	20.00	16	1-16	.0625	40	2.5
000000	15-32	.4688	300	18.75	17	9-160	.0563	36	2.25
00000	7-16	.4375	280	17.50	18	1-20	.05	32	2.
0000	13-32	.4063	260	16.25	19	7-160	.0438	28	1.75
000	3-8	.375	240	15.00	20	3-80	.0375	24	1.50
00	11-32	.3438	220	13.75	21	11-320	.0344	22	1.375
0	5-16	.3125	200	12.50	22	1-32	.0313	20	1.25
1	9-32	.2873	180	11.25	23	9-320	.0281	18	1.125
2	17-64	.2656	170	10.625	24	1-40	.025	16	1.
3	1-4	.25	160	10.00	25	7-320	.0219	14	.875
4	15-64	.2344	150	9.375	26	3-160	.0188	12	.75
5	7-32	.2188	140	8.75	27	11-640	.0172	11	.6875
6	13-64	.2031	130	8.125	28	1-64	.0156	10	.625
7	3-16	.1875	120	7.5	29	9-640	.0141	9	.5625
8	11-64	.1719	110	6.875	30	1-80	.0125	8	.5
9	5-32	.1563	100	6.25	31	7-640	.0109	7	.4375
10	9-64	.1406	90	5.625	32	13-1280	.0102	6 1-2	.4063
11	1-8	.125	80	5.00	33	3-320	.0094	6	.375
12	7-64	.1094	70	4.375	34	11-1280	.0086	5 1-2	.3438
13	3-32	.0938	60	3.75	35	5-640	.0078	5	.3125
14	5-64	.0781	50	3.125	36	9-1280	.0070	4 1-2	.2813
15	9-128	.0703	45	2.8125	37	17-5260	.0066	4 1-4	.2656
					38	1-160	.0063	4	.25

Weight of Iron and Steel Sheets—lbs.

Thickness by Birmingham Gage				Thickness by American (Brown & Sharpe's) Gage			
No. of Gage	Thickness, Inches	Weight per Sq. Ft.		No. of Gage	Thickness, Inches	Weight per Sq. Ft.	
		Iron	Steel			Iron	Steel
0000	.454	18.16	18.52	0000	.46	18.40	18.77
000	.425	17.00	17.34	000	.4096	16.38	16.71
00	.38	15.20	15.50	00	.3648	14.59	14.88
0	.34	13.60	13.87	0	.3249	13.00	13.26
1	.3	12.00	12.24	1	.2893	11.57	11.80
2	.284	11.36	11.59	2	.2576	10.30	10.51
3	.259	10.36	10.57	3	.2294	9.18	9.36
4	.238	9.52	9.71	4	.2043	8.17	8.34
5	.22	8.80	8.98	5	.1819	7.28	7.42
6	.203	8.12	8.28	6	.1620	6.48	6.61
7	.18	7.20	7.34	7	.1443	5.77	5.89
8	.165	6.60	6.73	8	.1285	5.14	5.24
9	.148	5.92	6.04	9	.1144	4.58	4.67
10	.134	5.36	5.47	10	.1019	4.08	4.16
11	.12	4.80	4.90	11	.0907	3.63	3.70
12	.109	4.36	4.45	12	.0808	3.23	3.30
13	.095	3.80	3.88	13	.0720	2.88	2.94
14	.083	3.32	3.39	14	.0641	2.56	2.62
15	.072	2.88	2.94	15	.0571	2.28	2.33
16	.065	2.60	2.65	16	.0508	2.03	2.07
17	.058	2.32	2.37	17	.0453	1.81	1.85
18	.049	1.96	2.00	18	.0403	1.61	1.64
19	.042	1.68	1.71	19	.0359	1.44	1.46
20	.035	1.40	1.43	20	.0320	1.28	1.31
21	.032	1.28	1.31	21	.0285	1.14	1.16
22	.028	1.12	1.14	22	.0253	1.01	1.03
23	.025	1.00	1.02	23	.0226	.904	.922
24	.022	.88	.898	24	.0201	.804	.820
25	.02	.80	.816	25	.0179	.716	.730
26	.018	.72	.734	26	.0159	.636	.649
27	.016	.64	.653	27	.0142	.568	.579
28	.014	.56	.571	28	.0126	.504	.514
29	.013	.52	.530	29	.0113	.452	.461
30	.012	.48	.490	30	.0100	.400	.408
31	.01	.40	.408	31	.0089	.356	.363
32	.009	.36	.367	32	.0080	.320	.326
33	.008	.32	.326	33	.0071	.284	.290
34	.007	.28	.286	34	.0063	.252	.257
35	.005	.20	.204	35	.0056	.224	.228

Specific gravity	Iron	7.7	Steel	7.854
Weight per cubic foot	"	480.	"	489.6
Weight per cubic inch	"	.2778	"	.2833

As many gages differ, and even the thicknesses of a certain specified gage are not assumed the same by all manufacturers, orders for sheets and wires should always state the weight per square foot or the thickness in thousandths of an inch.

Weight of Square and Round Bars of Steel

IN POUNDS PER LINEAR FOOT

Based on 489.6 lbs. per cubic foot. For Wrought Iron deduct 2 per cent. For High Speed Steel add 10 per cent.

Thickness or Diameter, Inches	Weight of Square Bar 1 foot long	Weight of Round Bar 1 foot long	Thickness or Diameter, Inches	Weight of Square Bar 1 foot long	Weight of Round Bar 1 foot long
1-32	.0033	.0026	2 1-2	21.25	16.69
1-16	.0133	.0104	9-16	22.33	17.53
1-8	.0531	.0417	5-8	23.43	18.40
3-16	.1195	.0938	11-16	24.56	19.29
1-4	.2123	.1669	3-4	25.00	20.20
5-16	.3333	.2608	13-16	26.90	21.12
3-8	.4782	.3756	7-8	28.10	22.07
7-16	.6508	.5111	15-16	29.34	23.04
1-2	.8500	.6676	3	30.60	24.03
9-16	1.076	.8449	1-16	31.89	25.04
5-8	1.328	1.043	1-8	33.20	26.08
11-16	1.608	1.262	3-16	34.55	27.13
3-4	1.913	1.502	1-4	35.92	28.20
13-16	2.245	1.763	5-16	37.31	29.30
7-8	2.603	2.044	3-8	38.73	30.42
15-16	2.989	2.347	7-16	40.18	31.56
1	3.400	2.670	1-2	41.65	32.71
1-16	3.838	3.014	9-16	43.14	33.90
1-8	4.303	3.379	5-8	44.68	35.09
3-16	4.795	3.766	11-16	46.24	36.31
1-4	5.312	4.173	3-4	47.82	37.56
5-16	5.857	4.600	13-16	49.42	38.81
3-8	6.428	5.019	7-8	51.05	40.10
7-16	7.026	5.518	15-16	52.71	41.40
1-2	7.650	6.008	4	54.40	42.73
9-16	8.301	6.520	1-16	56.11	44.07
5-8	8.978	7.051	1-8	57.85	45.44
11-16	9.682	7.604	3-16	59.62	46.83
3-4	10.41	8.178	1-4	61.41	48.24
13-16	11.17	8.773	5-16	63.23	49.66
7-8	11.95	9.388	3-8	65.08	51.11
15-16	12.76	10.02	7-16	66.95	52.58
2	13.60	10.68	1-2	68.85	54.07
1-16	14.46	11.36	9-16	70.78	55.59
1-8	15.35	12.06	5-8	73.73	57.12
3-16	16.27	12.78	11-16	74.70	58.67
1-4	17.22	13.52	3-4	76.71	60.25
5-16	18.19	14.28	13-16	78.74	61.84
3-8	19.18	15.07	7-8	80.81	63.46
7-16	20.20	15.86	15-16	82.89	65.10

Continued on next page.

Weight of Square and Round Bars of Steel

IN POUNDS PER LINEAR FOOT

(Continued)

Based on 489.6 lbs. per cubic foot. For Wrought Iron deduct 2 per cent. For High Speed Steel add 10 per cent.

Thickness or Diameter, Inches	Weight of Square Bar 1 foot long	Weight of Round Bar 1 foot long	Thickness or Diameter, Inches	Weight of Square Bar 1 foot long	Weight of Round Bar 1 foot long
5	85.00	66.76	7	166.6	130.9
1-16	87.14	68.44	1-8	172.6	135.6
1-8	89.30	70.14	1-4	178.7	140.4
3-16	91.49	71.86	3-8	184.9	145.3
1-4	93.72	73.60	1-2	191.3	150.2
5-16	95.96	75.37	5-8	197.7	155.2
3-8	98.23	77.15	3-4	204.2	160.3
7-16	100.5	78.95	7-8	210.8	165.6
1-2	102.8	80.77	8	217.6	171.0
9-16	105.2	82.62	1-8	224.5	176.3
5-8	107.6	84.49	1-4	231.4	181.8
11-16	110.0	86.38	3-8	238.5	187.3
3-4	112.4	88.29	1-2	245.6	193.0
13-16	114.9	90.22	5-8	252.9	198.7
7-8	117.4	92.17	3-4	260.3	204.4
15-16	119.9	94.14	7-8	267.9	210.3
6	122.4	96.14	9	275.4	216.3
1-16	125.0	98.14	1-8	283.2	222.4
1-8	127.6	100.2	1-4	291.1	228.5
3-16	130.2	102.2	3-8	298.9	234.7
1-4	132.8	104.3	1-2	306.8	241.0
5-16	135.5	106.4	5-8	315.0	247.4
3-8	138.2	108.5	3-4	323.2	253.9
7-16	140.9	110.7	7-8	331.6	260.4
1-2	143.6	112.8	10	340.0	267.0
9-16	146.5	114.9	1-4	357.2	280.6
5-8	149.2	117.2	1-2	374.9	294.4
11-16	152.1	119.4	3-4	392.9	308.6
3-4	154.9	121.7	11	411.4	323.1
13-16	157.8	123.9	1-4	430.3	337.9
7-8	160.8	126.2	1-2	449.6	353.1
15-16	163.6	128.5	3-4	469.4	368.6

To compute the weight of Sheet Steel:
Multiply the thickness by 40.8; the result is the weight in pounds per square foot.
Example: A piece of Sheet Steel is .005″ thick, its weight is .005 x 40.8 = .204 lbs. per square foot.

To compute the weight of Sheet Iron:
Multiply the thickness by 40; the result is the weight in pounds per square foot.
Example: A piece of Sheet Iron is .005″ thick, its weight is .005 x 40 = .200 lbs. per square foot.

Comparative Weights of Steel and Brass Bars

Steel—Weights cover hot worked steel about 50% carbon. One cubic inch weighs .2833 lbs. High speed steel 10% heavier.

Brass—One cubic inch weighs .3074 lbs.

Actual weight of stock may be expected to vary somewhat from these figures because of variations in manufacturing processes.

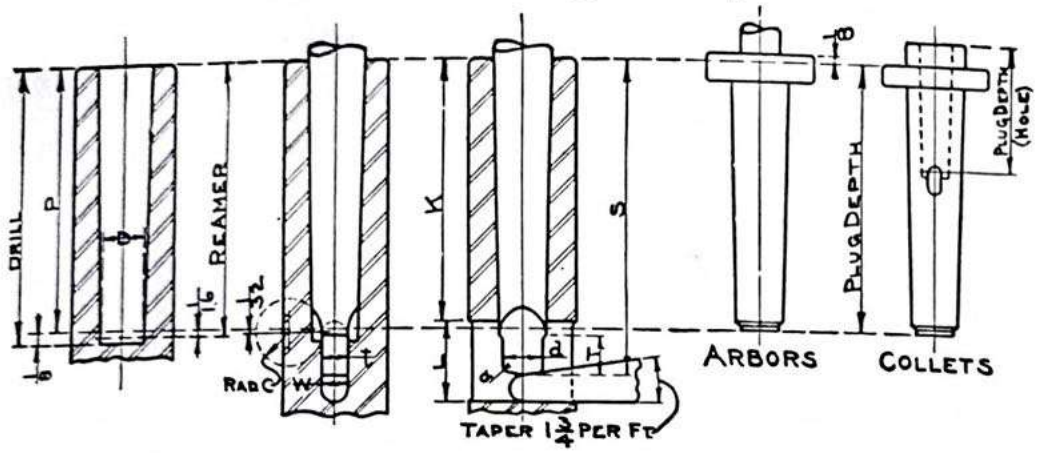
Size, Inches	Weight of Bar One Foot Long, Lbs.					
	Steel			Brass		
	○	□	⬡	○	□	⬡
1/16	.0104	.013	.0115	.0113	.0144	.0125
1/8	.042	.05	.046	.045	.058	.050
3/16	.09	.12	.10	.102	.130	.112
1/4	.17	.21	.19	.18	.23	.20
5/16	.26	.33	.29	.28	.36	.31
3/8	.38	.48	.42	.41	.52	.45
7/16	.51	.65	.56	.55	.71	.61
1/2	.67	.85	.74	.72	.92	.80
9/16	.85	1.08	.94	.92	1.17	1.01
5/8	1.04	1.33	1.15	1.13	1.44	1.25
11/16	1.27	1.61	1.40	1.37	1.74	1.51
3/4	1.50	1.92	1.66	1.63	2.07	1.80
13/16	1.76	2.24	1.94	1.91	2.43	2.11
7/8	2.04	2.60	2.25	2.22	2.82	2.45
15/16	2.35	2.99	2.59	2.55	3.24	2.81
1	2.67	3.40	2.94	2.90	3.69	3.19
1 1/16	3.01	3.84	3.32	3.27	4.16	3.61
1 1/8	3.38	4.30	3.73	3.67	4.67	4.04
1 3/16	3.77	4.80	4.16	4.08	5.20	4.51
1 1/4	4.17	5.31	4.60	4.53	5.76	4.99
1 5/16	4.60	5.86	5.07	4.99	6.35	5.50
1 3/8	5.04	6.43	5.56	5.48	6.97	6.04
1 7/16	5.52	7.03	6.08	5.99	7.62	6.60
1 1/2	6.01	7.65	6.63	6.52	8.30	7.19
1 9/16	6.52	8.30	7.19	7.07	9.01	7.80
1 5/8	7.05	8.98	7.77	7.65	9.74	8.44
1 11/16	7.60	9.68	8.38	8.25	10.51	9.10
1 3/4	8.18	10.41	9.02	8.87	11.30	9.78
1 13/16	8.77	11.17	9.67	9.52	12.12	10.49
1 7/8	9.39	11.95	10.35	10.19	12.97	11.24
1 15/16	10.02	12.76	11.05	10.88	13.85	12.00
2	10.68	13.60	11.78	11.59	14.76	12.78
2 1/16	11.36	14.46	12.53	12.33	15.69	13.60
2 1/8	12.06	15.35	13.30	13.08	16.66	14.42
2 3/16	12.78	16.27	14.09	13.87	17.65	15.29
2 1/4	13.52	17.22	14.91	14.67	18.68	16.17
2 5/16	14.28	18.19	15.75	15.50	19.73	17.09
2 3/8	15.06	19.18	16.62	16.34	20.81	18.02

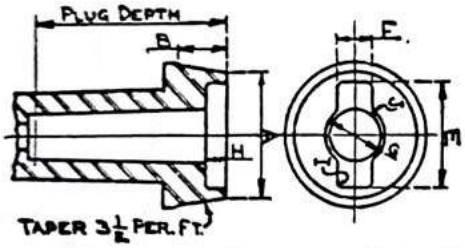
Tapers

TAPERS FROM 1-16 TO 1 1-4 INCH PER FOOT
AMOUNT OF TAPER FOR LENGTHS UP TO 24 INCHES

Length Tapered Inches	TAPER PER FOOT									
	1-16	3-32	1-8	1-4	3-8	1-2	5-8	3-4	1	1 1-4
1-32	.0002	.0002	.0003	.0007	.0010	.0013	.0016	.0020	.0026	.0033
1-16	.0003	.0005	.0007	.0013	.0020	.0026	.0033	.0039	.0052	.0065
1-8	.0007	.0010	.0013	.0026	.0039	.0052	.0065	.0078	.0104	.0130
3-16	.0010	.0015	.0020	.0039	.0059	.0078	.0098	.0117	.0156	.0195
1-4	.0013	.0020	.0026	.0052	.0078	.0104	.0130	.0156	.0208	.0260
5-16	.0016	.0024	.0033	.0065	.0098	.0130	.0163	.0195	.0260	.0326
3-8	.0020	.0029	.0039	.0078	.0117	.0156	.0195	.0234	.0312	.0391
7-16	.0023	.0034	.0046	.0091	.0137	.0182	.0228	.0273	.0365	.0456
1-2	.0026	.0039	.0052	.0104	.0156	.0208	.0260	.0312	.0417	.0521
9-16	.0029	.0044	.0059	.0117	.0176	.0234	.0293	.0352	.0469	.0586
5-8	.0033	.0049	.0065	.0130	.0195	.0260	.0326	.0391	.0521	.0651
11-16	.0036	.0054	.0072	.0143	.0215	.0286	.0358	.0430	.0573	.0716
3-4	.0039	.0059	.0078	.0156	.0234	.0312	.0391	.0469	.0625	.0781
13-16	.0042	.0063	.0085	.0169	.0254	.0339	.0423	.0508	.0677	.0846
7-8	.0046	.0068	.0091	.0182	.0273	.0365	.0456	.0547	.0729	.0911
15-16	.0049	.0073	.0098	.0195	.0293	.0391	.0488	.0586	.0781	.0977
1	.0052	.0078	.0104	.0208	.0312	.0417	.0521	.0625	.0833	.1042
2	.0104	.0156	.0208	.0417	.0625	.0833	.1042	.125	.1667	.2083
3	.0156	.0234	.0312	.0625	.0937	.1250	.1562	.1875	.250	.3125
4	.0208	.0312	.0417	.0833	.125	.1667	.2083	.250	.3333	.4167
5	.0260	.0391	.0521	.1042	.1562	.2083	.2604	.3125	.4167	.5208
6	.0312	.0469	.0625	.125	.1875	.250	.3125	.375	.500	.625
7	.0365	.0547	.0729	.1458	.2187	.2917	.3646	.4375	.5833	.7292
8	.0417	.0625	.0833	.1667	.250	.3333	.4167	.500	.6667	.8333
9	.0469	.0703	.0937	.1875	.2812	.375	.4687	.5625	.750	.9375
10	.0521	.0781	.1042	.2083	.3125	.4167	.5208	.625	.8333	1.0417
11	.0573	.0859	.1146	.2292	.3437	.4583	.5729	.6875	.9167	1.1458
12	.0625	.0937	.125	.250	.375	.500	.625	.750	1.000	1.250
13	.0677	.1016	.1354	.2708	.4062	.5417	.6771	.8125	1.0833	1.3542
14	.0729	.1094	.1458	.2917	.4375	.5833	.7292	.875	1.1667	1.4583
15	.0781	.1172	.1562	.3125	.4687	.625	.7812	.9375	1.250	1.5625
16	.0833	.125	.1667	.3333	.500	.6667	.8333	1.000	1.3333	1.6667
17	.0885	.1328	.1771	.3542	.5312	.7083	.8854	1.0625	1.4167	1.7708
18	.0937	.1406	.1875	.3750	.5625	.750	.9375	1.125	1.500	1.875
19	.0990	.1484	.1979	.3958	.5937	.7917	.9896	1.1875	1.5833	1.9792
20	.1042	.1562	.2083	.4167	.625	.8333	1.0417	1.250	1.6667	2.0833
21	.1094	.1641	.2187	.4375	.6562	.875	1.0937	1.3125	1.750	2.1875
22	.1146	.1719	.2292	.4583	.6875	.9167	1.1458	1.375	1.8333	2.2917
23	.1198	.1797	.2396	.4792	.7187	.9583	1.1970	1.4375	1.9167	2.3958
24	.125	.1875	.250	.500	.750	1.000	1.250	1.500	2.000	2.500

Brown & Sharpe Tapers





Dimensions of Mill. Machine Spindles (Taper-Nose)

A‡	B	E	F	G	H	I	J
3.045	2	2½	1	1 3/8	5/8	3/16	1/8
5.255	2⅛	4½	1½	2 13/32	7/8	¼	¼

‡Diameter at sharp corner.

Taper approximates 1-2″ per ft. except No. 10 which is .5161″ per ft.

No. of Taper	Diam. of Plug at Small End	Plug Depth P			Keyway from End of Spindle	Shank Depth	Length of Keyway†	Width of Keyway	Length of Arbor Tongue	Diameter of Arbor Tongue	Thickness of Arbor Tongue	Radius of Tongue Circle	Radius of Tongue at a	Limit for Tongue —to project thru Test Tool
		B & S* Standard	Mill. Mach. Standard	Miscell.										
	D				K	S	L	W	T	d	t	c	a	
1	.200	15/16			15/16	1 3/16	3/8	.135	3/16	.170	1/8	3/16	.030	.003
2	.250	1 3/16			1 11/64	1½	½	.166	¼	.220	5/32	3/16	.030	.003
3	.312	1½			1 15/32	1⅞	5/8	.197	5/16	.232	3/16	3/16	.040	.003
				1¾	1 23/32	2⅛	5/8	.197	5/16	.232	3/16	3/16	.040	.003
				2	1 31/32	2⅜	5/8	.197	5/16	.232	3/16	3/16	.040	.003
4	.350		1¼		1 13/64	1 21/32	11/16	.228	11/32	.320	7/32	5/16	.050	.003
		1 11/16			1 41/64	2 3/32	11/16	.228	11/32	.320	7/32	5/16	.050	.003
5	.450		1¾		1 11/16	2 3/16	¾	.260	⅜	.420	¼	5/16	.060	.003
				2	1 15/16	2 7/16	¾	.260	⅜	.420	¼	5/16	.060	.003
		2⅛			2 1/16	2 9/16	¾	.260	⅜	.420	¼	5/16	.060	.003

Continued on next page.

Brown & Sharpe Tapers (*Continued*)

No. of Taper	Diam. of Plug at Small End	Plug Depth P			Keyway from End of Spindle	Shank Depth	Length of Keyway†	Width of Keyway	Length of Arbor Tongue	Diameter of Arbor Tongue	Thickness of Arbor Tongue	Radius of Tongue Circle	Radius of Tongue at a	Limit for Tongue —to project thru Test Tool
		B & S* Standard	Mill. Mach. Standard	Miscell.										
	D				K	S	L	W	T	d	t	c	a	
6	.500	2 3/8			2 19/64	2 7/8	7/8	.291	7/16	.460	9/32	5/16	.060	.005
7	.600			2 1/2	2 13/32	3 1/32	15/16	.322	15/32	.560	5/16	3/8	.070	.005
		2 7/8			2 25/32	3 13/32	15/16	.322	15/32	.560	5/16	3/8	.070	.005
			3		2 29/32	3 17/32	15/16	.322	15/32	.560	5/16	3/8	.070	.005
8	.750	3 9/16			3 29/64	4 1/8	1	.353	1/2	.710	11/32	3/8	.080	.005
9	.900		4		3 7/8	4 5/8	1 1/8	.385	9/16	.860	3/8	7/16	.100	.005
		4 1/4			4 1/8	4 7/8	1 1/8	.385	9/16	.860	3/8	7/16	.100	.005
10	1.0446	5			4 27/32	5 23/32	1 5/16	.447	21/32	1.010	7/16	7/16	.110	.005
			5 11/16		5 17/32	6 13/32	1 5/16	.447	21/32	1.010	7/16	7/16	.110	.005
				6 7/32	6 1/16	6 15/16	1 5/16	.447	21/32	1.010	7/16	7/16	.110	.005
11	1.250	5 15/16			5 25/32	6 21/32	1 5/16	.447	21/32	1.210	7/16	1/2	.130	.005
			6 3/4		6 19/32	7 15/32	1 5/16	.447	21/32	1.210	7/16	1/2	.130	.005
12	1.500	7 1/8	7 1/8		6 15/16	7 15/16	1 1/2	.510	3/4	1.460	1/2	1/2	.150	.005
				6 1/4										
13	1.750	7 3/4			7 9/16	8 9/16	1 1/2	.510	3/4	1.710	1/2	5/8	.170	.010
14	2.00	8 1/4	8 1/4		8 1/32	9 5/32	1 11/16	.572	27/32	1.960	9/16	3/4	.190	.010
15	2.25	8 3/4			8 17/32	9 21/32	1 11/16	.572	27/32	2.210	9/16	7/8	.210	.010
16	2.50	9 1/4			9	10 1/4	1 7/8	.635	15/16	2.450	5/8	1	.230	.010
17	2.75	9 3/4												
18	3.00	10 1/4												

*"B & S Standard" Plug Depths are not used in all cases.

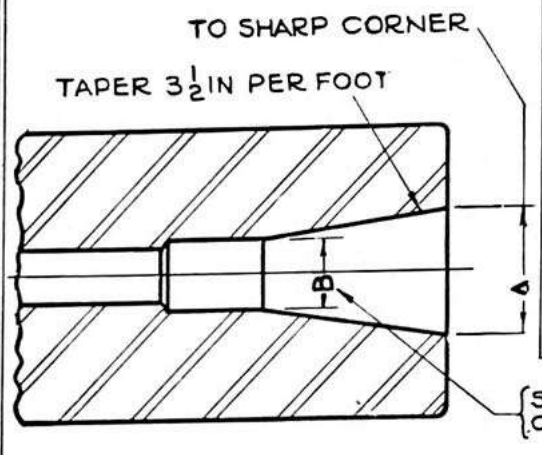
†Special lengths of keyway are used instead of standard lengths in some places. Standard lengths need not be used when keyway is for driving only and not for admitting key to force out tool.

Approximate Diameters at Large Ends of Brown & Sharpe Standard Taper Holes at Standard Plug Depths

No. of Taper	Approx. Diam. at Large End, Inches	No. of Taper	Approx. Diam. at Large End, Inches	No. of Taper	Approx. Diam. at Large End, Inches
6	19-32	10	1 1-4	14	2 11-32
7	23-32	11	1 1-2	16	2 7-8
9	1 1-16	12	1 13-16	18	3 7-16

Milling Machine Standard Tapers

as adopted by the Milling Machine Manufacturers of the National Machine Tool Builders' Association



No. of Taper	A	B	*Threaded End of Draw-In Bolt
10	5-8	3-8	
20	7-8	1-2	
30	1 1-4	5-8	
40	1 3-4	1	7-16″ 14 N.C., R.H. 5-8″ 11 N.C., R.H.
50	2 3-4	1 9-16	5-8″ 11 N.C., R.H. 1″ 8 N.C., R.H.

*End of Draw-In Bolt is threaded with two sizes of thread. The larger size thread is used in threaded hole in Arbors and in Adapters where possible, but limitations on certain Adapters require the use of a threaded hole to fit the smaller Threaded End of the Draw-In Bolt.

The Jarno Taper

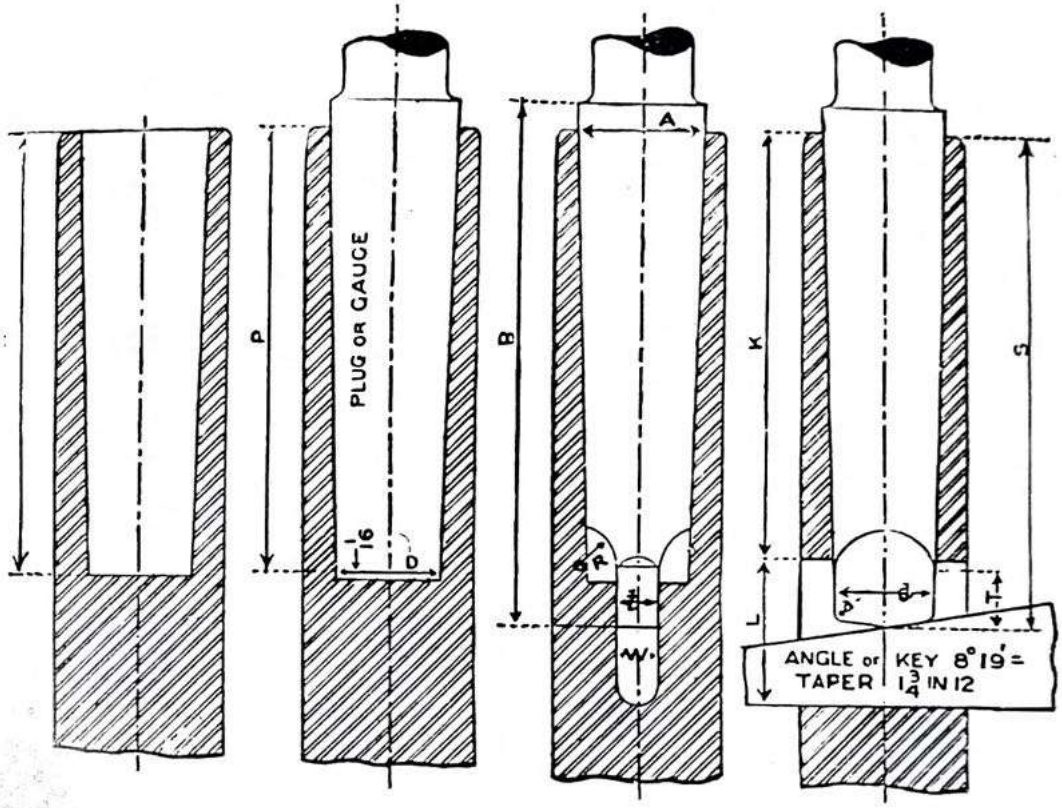
Taper per Foot = 0.6 Inch. Taper per Inch = 0.05 Inch.

$$\text{Diam. Large End} = \frac{\text{No. of Taper}}{8} \qquad \text{Diam. Small End} = \frac{\text{No. of Taper}}{10}$$

$$\text{Length of Taper} = \frac{\text{No. of Taper}}{2}$$

In the Jarno system, the taper of which is 0.6 inch per foot or 1 in 20, the number of the taper is the key by which all the dimensions are immediately determined. That is, the number of the taper is the number of tenths of an inch in diameter at the small end, the number of eighths of an inch at the large end, and the number of halves of an inch in length or depth. For example: the No. 6 taper is six-eighths (3-4) inch diameter at large end, six-tenths (6-10) inch diameter at the small end and six-halves (3) inches in length. Similarly, the No. 16 taper is sixteen-eighths, or 2 inches diameter at the large end; sixteen-tenths or 1.6 inches at the small end and sixteen-halves or 8 inches in length.

Morse Tapers



Number of Taper	Diam. of Plug at Small End, Inches	Diam. at End of Socket, Inches	SHANK		Depth of Hole, Inches	Standard Plug Depth, Inches	TONGUE					KEYWAY			Taper per Foot	Taper per Inch	Number of Key
			Whole Length of Shank, Inches	Shank Depth, Inches			Thickness of Tongue, Inches	Length of Tongue, Inches	Rad. of Mill for Tongue, Inches	Diameter of Tongue, Inches	Radius of Tongue, Inches	Width of Keyway, Inches	Length of Keyway, Inches	End of Socket to Keyway, Inches			
	D	A	B	S	H	P	t	T	R	d	a	W	L	K			
0	.252	.3561	2 11/32	2 7/32	2 1/32	2	5/32	1/4	5/32	.235	.04	.160	9/16	1 15/16	.62460	.05205	0
1	.369	.475	2 9/16	2 7/16	2 3/16	2 1/8	13/64	3/8	3/16	.343	.05	.213	3/4	2 1/16	.59858	.04988	1
2	.572	.700	3 1/8	2 15/16	2 5/8	2 9/16	1/4	7/16	1/4	17/32	.06	.260	7/8	2 1/2	.59941	.04995	2
3	.778	.938	3 7/8	3 11/16	3 1/4	3 3/16	5/16	9/16	9/32	23/32	.08	.322	1 3/16	3 1/16	.60235	.05019	3
4	1.020	1.231	4 7/8	4 5/8	4 1/8	4 1/16	15/32	5/8	5/16	31/32	.10	.478	1 1/4	3 7/8	.62326	.05193	4
5	1.475	1.748	6 1/8	5 7/8	5 1/4	5 3/16	5/8	3/4	3/8	1 13/32	.12	.635	1 1/2	4 15/16	.63151	.05262	5
6	2.116	2.494	8 9/16	8 1/4	7 3/8	7 1/4	3/4	1 1/8	1/2	2	.15	.760	1 3/4	7	.62565	.05213	6
7	2.750	3.270	11 5/8	11 1/4	10 1/8	10	1 1/8	1 3/8	3/4	2 5/8	.18	1.135	2 5/8	9 1/2	.62400	.05200	7

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